Volume 32, Number 2 July 2008

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Chest & Heart Journal
Vol. 32, No.-2, July 2008

CASE REPORT

Pulmonary Sarcoidosis Presenting As Chronic Cough – A Case Report

Md. Shahedur Rahman Khan[1], Shamim Ahmed[2], Md. Atiqur Rahman[3], Mirza Mohammed Hiron[3], AKM Mostofa Hussain[4], Md Abdul Qayyum[6] Md. Abdur Rouf[6] Md. Delwar Hossain[7], Shah Mesbahul Islam[7], Taslima Begum[8]

Abstract:
In this article, we report a 56-year-old gentleman with Sarcoidosis involving lung and lymphnodes.This nonsmoker, non asthmatic patient had presented to NIDCH with persistent nonproductive cough over one year with occasional low grade fever with evening predilection for the same duration. He had mild anorexia but no significant weight loss. Physical examination was normal including chest findings. Initial chest radiograph that showed bilateral parahilar shadows with reticulonodular lung opacities arose suspicion of Sarcoidosis. MT was zero, ESR was 10mm in 1st hr, CT scan of chest noted bilateral hilar lymphadenopathy with pulmonary infiltrate consistent with Sarcoidosis stage II. That was confirmed with bronchial biopsy by FOB from a nodular mass (granuloma) as noncaseating granuloma. BAL fluid revealed predominant Lymphocyte. We started oral corticosteroid in 1mg/kg/day as starting dose for 3 months then 5mg/kg/day for up to 6 months. Then gradually tapered and total treatment duration was one year long. Patient is now fully symptom free with total radiological clearance of the lung shadows.

[Chest & Heart Journal 2008; 32(2) : 118-122]

Introduction

Sarcoidosis is a chronic multisystem disease of unknown aetiology characterized by the formation of immune granulomas on involved organs [1]. The distribution of the disease is world wide and no age group, sex or race is immune. It is rare on Southeast Asia. It mainly affects 25 – 40 years old people with a life time incidence rate 0.85 – 2.4 % Females appear to be slightly more susceptible than male [2].Various clinical phenotypes are observed according to involved organs, disease duration and severity. Though Sarcoidosis can involve any organ in the body, it primarily affects lung and lymphatic system. So far the aetiology is unknown, prevailing hypothesis is that various antigens could promote Sarcoidosis in genetically susceptible hosts [3].

Various infections and noninfectious agents have been implicated. Interferon-ã, TNF á, IL 12 and IL 18 play a critical role in the driving the Th1 commitment in the course of granulomatus process. Clinical presentation may be acute, sub acute or chronic. Presentation depends on organ involved and extent of involvement. Organ

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dysfunction in Sarcoidosis is mainly due to distortion of organ architecture by infiltration of inflammatory cells and fibrosis of the granulomas [4].

Evolution of Sarcoidosis is often marked by spontaneous resolution with in 12-36 months but can be severe because of chronic cases with pulmonary fibrosis or involving other organ including heart, CNS and eyes. Mortality ranging between 0.5 and 5% is most often related to pulmonary fibrosis [5]. Management of Sarcoidosis includes several crucial decisions. Not all patients with Sarcoidosis need treatment. At least one third of patients will never be treated. It is unclear whether asymptomatic patients ever need therapy, even if they have extensive lung disease[6].

Corticosteroids can reverse the granulomatous process but are only suspensive and their long term benefit remains under questions. Corticosteroids are recommended when Sarcoidosis shows unfavorable clinical tolerance and evolution. Alternative and corticosteroid sparing agents are methotrexate, azothioprine and hydroxychloroquine (2nd line therapy). Another group of patient called refractory patients who have progressive disease whilst on therapy. New agents such as thalidomide and monoclonal antibodies to TNF-á have been occasionally helpful[7].

Being a rare disease in Southeast Asia and also presentation in an elderly person of 56 yr age an unusual age as typical presentation of pulmonary tuberculosis and a very good therapeutic response with systemic steroid, we find it of academic interest to report the case and highlight the clinical, diagnostic and management profiles.

Case presentation

A 56 years old gentle man, non smoker, non asthmatic, normotensive, school teacher by profession hailing from Maizdee, Noakhali on13th June 2007 had been referred to NIDCH with a history of persistent nonproductive cough with low grade intermittent fever with evening rise over one year having disgusted with antikoch's for 1 month. Patient had mild anorexia but his weight was static. He had no shortness of breath. Physical examination of this apparently normal looking black complexioned, well cooperative senior man revealed no abnormality. His vital signs were unremarkable, respiratory system examination was normal, abdomen was soft and nontender, liver and spleen were not palpable. He had no approachable lymphadenopathy. The investigations already done out side NIDCH were chest radiography as bilateral parahilar shadow with reticulonodular opacities in both lungs medially. Hb was15 gm/dl, ESR was 10 mm 1st hr, WBC was 8260 /cmm, P – 56%, L – 26%, E -11 % Mantaux test was zero. We stopped antiTB and started relevant investigations for further evaluation and to exclude possible other differential diagnosis like lymphoma and tuberculosis Spirometry showed mild restrictive pattern. Serum IgE and total circulating esonophil counts were with in normal limit. HRCT Scan of Chest demonstrated bilateral hilar lymphadenopathy with reliculonodular pulmonary infiltrate. Bronchial biopsy by FOB from a nodular mass (granuloma) in distal part of right principle bronchus showed a noncaseating granuloma. BAL fluid revealed predominant lymphocyte.

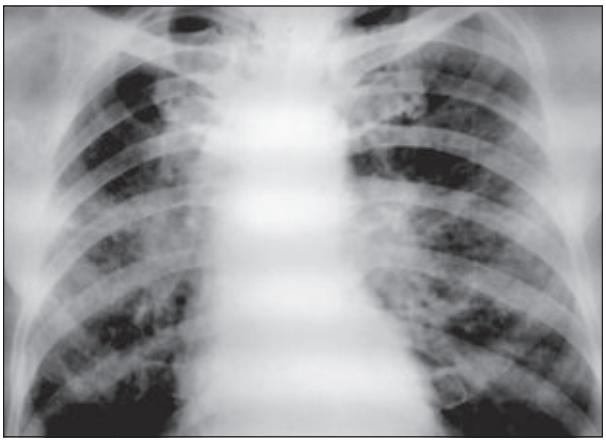

Fig.-1: *CXR showing bilateral hilar and paratracheal lymphadenopathy with reticulonodular pulmonary infiltrate.*

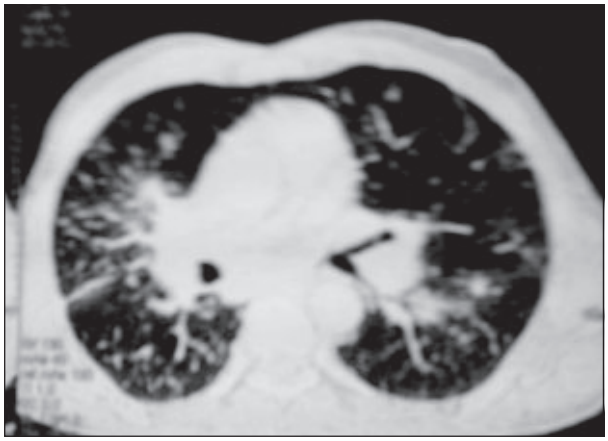

Fig.-2: *HRCT of chest showing bilateral hilar lymphadenopathy with reticulonodular pulmonary infiltrate*

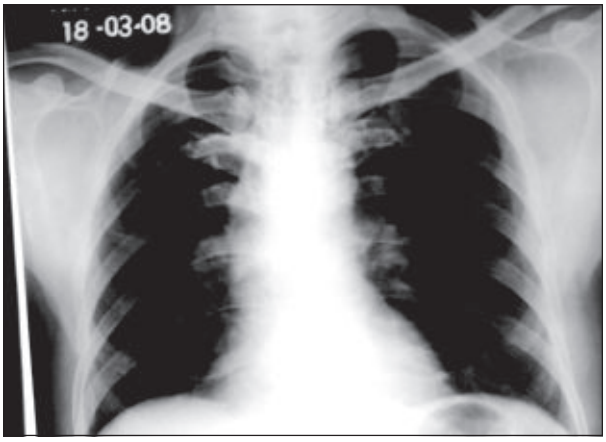

Fig.-3: *Chest X-ray PA view of this patient after steroid therapy for six months showing totally normal findings*

At this stage serum calcium was found normal. Serum ACE could not be done due to non availability of the test in our quality laboratory in Dhaka city. ABG was done and found normal. Other investigations including serum electrolyte, liver function tests, renal function tests and ophthalmic examination were normal. Abdominal ultrasonography revealed no abnormal finding. Being confirmed as a case of symptomatic Sarcoidosis Stage II, we have started treatment with prednisolone 1 mg/kg as single morning dose after breakfast for 3 months. CXR at end of 3rd month showed marked improvement that was consistent with patient's subjective improvement of his cough as well as appetite.

Mean while patient looked a bit Cushingoid. Then we reduced steroid dose to 0.5 mg/kg/day for next 3 months. At the end of 6th month radiography showed total resolution of the opacities and patient was fully relieved symptomatically. Then the dose was tapered to ½ of the previous dosage for next 2 months. Then as 10 mg/day for next 2 months and then 5mg/day for last next 2 months. CXR at the end of 12th months was absolutely normal. Patient had no cough and his appetite became normal and steroid induced obesity had reduced to near normal stage of patient. BP was normal. No other side effects of steroid were noted including high blood sugar. Other medications concomitantly continued for whole one year were Pantoprazole 40mg/day and vitamins with minerals (A to Z). Patients was discharged at the end of first month and he was regularly followed on out door basis at monthly interval for 1st 3 months then 2 monthly up to 6 months and finally 3 monthly for last 6months.

Discussion

The prevalence of Sarcoidosis has been estimated at 15/100000 population and in the USA is three times more prevalent in black than whites [8]. Although the aetiology of Sarcoidosis is unknown genetic, infection and environmental factors have been postulated as possible causes. A putative genetic pathogenesis has been suggested due to the prescence of familial clustering. In addition positive association with HLA-A1, HLA-B8 and HLA-DR3 has been identified. Infectious agents such as Mycobacterium, Propionobacteria, Epstein-Bar virus and human herpes virus-8 have been considered as possible aetiological agents. Similarly environmental factors (wood dust, pollen, clay, mold, silica) and occupational exposure (farmers, fire fighters, military) have been suggested as aetiological agents [9]. An immunological response results from one or a combination of factors mentioned above. The T-helper 1 (Th1) lymphocytes play a central role in granuloma formation which is thought to be the result of deposition of poorly soluble antigenic material in the tissue. This antigenic material is taken up by antigen presenting cells such as macrophages or dendritic cells which then expose it to T-lymphocytes. In response to these antigens, a local amplification of the cellular immune reaction takes place. In addition mononuclear phagocytes and other inflammatory cells migrate to the site of the antigenic deposition under the influence of the chemokines and cytokines produced by Th1 cells. This results in the formation of a granuloma [10]. Sarcoidosis is a multiorgan disorder. The clinical symptoms depend on the ethnicity, chronicity of illness, site and extent of involvement of the organ and activity of the granulomas [11]. One-third of the patients with Sarcoidosis can present with non-specific constitutional symptoms such as fever, fatigue, malaise or weight loss. The most common presentation of Sarcoidosis consists of pulmonary infiltration and hilar lymphadenopathy, dermal and ocular lesions. Symptomatic pulmonary Sarcoidosis usually present with dyspnoea and dry cough and occasionally with other chest symptoms.Sarcoidosis is a diagnosis of exclusion. No diagnostic tests or specific markers have been

established yet [12]. The diagnosis is based upon history (occupational or environmental exposure), pulmonary function tests (forced expiratory volume, vital capacity), haematology(Complete blood count, erythrocyte sedimentation rate), biochemical investigations (liver and renal function tests, serum calcium, and serum angiotensin converting enzyme levels), chest radiograph and histological studies. The serum angiotensin converting enzyme (ACE) level is elevated in 50–80% of patients with Sarcoidosis [13]. It is useful in monitoring the disease progression and effectiveness of therapy. The ACE level is also elevated in diabetes mellitus, cirrhosis, leprosy and many other conditions. Therefore ACE level has to be used as an adjunct [14]. But in our case, ACE level could not be measured due to nonavaiability this test in our renowned laboratories in Dhaka. Depending on the involvement of the lungs and the lymph nodes Sarcoidosis in the chest radiograph may be staged as follows: Stage 0: Normal chest radiograph. Stage I: Bilateral hilar lymphadenopathy without pulmonary infiltrates. Stage II: Bilateral hilar lymphadenopathy with pulmonary infiltrates. Stage III: Pulmonary infiltrates without hilar lymphadenopathy. Stage IV: End-stage fibrosis, cystic cavities and honeycombing[15]. Biopsy of the involved tissues shows non-caseating granulomas. May occasionally contain many inclusion bodies such as Schumann bodies or stellate asteroid bodies. Treatment is not required for all patients with Sarcoidosis. Several specific conditions which require treatment include the Sarcoidosis of the heart and nerves, hypercalcemia and ocular involvement that do not respond to local therapy. Asymptomatic pulmonary involvement does not require treatment while treatment is indicated in symptomatic pulmonary Sarcoidosis with worsening pulmonary function tests. Our patient was symptomatic. So we started steroid therapy. Corticosteroids have remained as the mainstay in the treatment of Sarcoidosis. A major problem in treatment of Sarcoidosis patient is relapse. More than 70% of patients treated with corticosteroid relapsed within a 2 year period [16]. Antimalarial drugs such as chloroquine and hydroxychloroquine have been particularly useful in the treatment of cutaneous and mucosal Sarcoidosis including sinus and laryngeal Sarcoidosis. They are used in combination with low dose corticosteroids. Periodic eye examination and monitoring liver function are recommended [17].Melatonin; an immunoregulatory drug has been of recent interest [18].

Conclusion

In country like us where tuberculosis is very prevalent, even with classical symptoms one should not be preoccupied and should consider the differential diagnosis so that the less prevalent disease like Sarcoidosis will not go undiagnosed. Response with steroid in our case is found excellent. We kept the patient in follow up three monthly for minimum two years.

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Chest & Heart Journal
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ORIGINAL ARTICLE

A Randomized Controlled Comparison of Tiotropium and Ipratropium in the Treatment of Chronic Obstructive Pulmonary Disease

Ahmad Zainuddin Sani[1], Md. Mostafizur Rahman[2], Asif Mujtaba Mahmud[3], Mirza Mohammad Hiron[4], Ali Hossain[4], Md. Rashidul Hassan[4], M. A. Rouf[5], Mahmud Rahim[6]

Abstract

The study was designed to compare the effectiveness of two anticholinergic currently available Tiotropium 18μg with Ipratropium 40 μg administered through Metered Dose Inhaler.

The study was conducted in outpatient department of the National Institute of Diseases of the Chest & Hospital, Dhaka, for a period of two years, starting from January 2005 to December 2006.

A standard proforma with questions was designed and filled to select patients with moderate to severe COPD. The patients were selected according to the predetermined criteria. To establish the diagnosis and for pretreatment evaluation, necessary baseline investigations were done. P value <0.05 was taken as significant in all analysis. The patients were allocated in two treatment groups by simple random sampling using random number table. 45 random numbers were selected from random number table and assigned in group A. The rest are assigned to group B. Patients in group A were treated by Inhaler Triotropium once daily + inhaled Ipratropium matched placebo four times daily and the rest in group B were treated Tiotropium matched placebo once daily + Ipratropium 40 μg four times daily. There were 87 males and 3 females. Mean age was 60.62±10.03 in group A and 57.24±10.26 in group B. The majority of the study patients fell within the range of 50-70 years. All were smoker. Both groups were homogenous in respect to age, sex, level of education and socio-economic condition.

Clinical evaluation, peak expiratory flow rate (PEFR), FEV1, FVC and FEV1/ FVC were done. Post-treatment evaluation including pulmonary function test were done on day 8, day 21 and day 42. No other bronchodilator was allowed during this study period except an open level inhaled short acting beta 2 agonist, the use of which was allowed on demand and also recorded. At the end of study Mini COPD health score questionnaire was asked and the score calculated.

There were statistically significant improvement in trough PEFR, FEV1 and FVC in group A compared to group B.

[Chest & Heart Journal 2008; 32(2) : 68-80]

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At the end of day 8 it was 0.0702±0.013, 0.0581±0.012, 6.5349±1.39 respectively in group A and 0.0235±0.011, 0.0095±0.004 and 2.0930±0.81 respectively in group B. (p<.001). The mean difference of Trough FVC, FEV1 and PEFR from baseline on day 21 was 0.0810±0.013, 0.0617±0.013, 6.9756±1.46 respectively in group A and 0.0241±0.010, 0.0095±0.004 and 2.0488±0.77 respectively in group B (p<.001). There is a small increase in all parameters. At the end of 6 week the mean difference of Trough FVC, FEV1 and PEFR at the end of day 42 was 0.0910±.014, 0.0772±.012, 7.1282±1.51 respectively in group A and 0.0263±0.011, 0.0095±0.004and 2.0488±0.77 respectively in group B (p<.001).

The composite score of "Mini COPD health score" was 51.38±1.29 in group A and 53.44±2.08 in group B. The difference is statistically significant (p<0.001) and better in Tiotropium group.

The use of concomitant salbutamol was 1.49±0.63 in group A and 1.26±0.54 in group B. The difference of which is not statistically significant (p>0.05).

Tiotropium in a dose of 18 μg inhaled once daily MDI was significantly more effective than 40 μg ipratropium four times daily in improving trough PEFR, FEV1 and FVC as well as Mini COPD health score over 6 weeks period. These data support the use of tiotropium as first line treatment for the long term maintenance treatment of patients with airflow obstruction due to COPD.

Introduction

COPD is a major cause of chronic morbidity and mortality throughout the world. Many people suffer from this disease for years and die prematurely from it or its complications. COPD is currently the fourth leading cause of death in the world.

In patients with chronic obstructive pulmonary disease (COPD) bronchodilators are the first line approach to treatment.[1] The spirometric response to bronchodilators such as β_2 agonists, anticholinergic agents and methylxanthines is, at best, very modest. However, even in the absence of significant bronchodilation an improvement in symptoms and exercise tolerance can be found.2

In COPD cholinergic vagal tone is thought to be the only reversible component of airway obstruction.[3] Currently, anticholinergics feature prominently in European and American guidelines.[1,4] The anticholinergic agent ipratropium is an effective and safe drug with few side effects and without signs of tolerance during chronic treatment. However, its duration of action is limited to 4–6 hours and the agent is a non-selective blocker of all muscarinic receptor subtypes.[3,5] Blocking of M2 receptors may account for some cases of paradoxical bronchoconstriction.[6]

Tiotropium is a quaternary ammonium compound which is structurally related to ipratropium.

In vitro work has shown that the compound has a unique kinetic selectivity for M3 and M1 versus M2 receptors and dissociates 100 times more slowly than ipratropium from M3 and M1 receptors.[7,8] Only a few clinical single dose studies have so far been published in patients with COPD and asthma, which confirm that tiotropium is a potent and long acting bronchodilator suited for once daily administration.[9-11] Long term studies of more than one month have not been reported. The present study was designed to evaluate and compare the efficacy and safety of tiotropium (18μg) from a dry powder inhaler (DPI) once daily and ipratropium (40μg) from a metered dose inhaler (MDI) four times daily in patients with stable, moderate to severe airway obstruction due to COPD. This study reports the first 13 weeks of a one year study with the focus on lung function.

Methodology

It is a prospective comparative study. This study was carried out in the Outpatient Department of National Institute of Diseases of the Chest & Hospital (NIDCH), Mohakhali, Dhaka, from January 2005 to December 2006. Patients with clinical diagnosis of COPD, as defined by the following inclusion and exclusion criteria were included in the study.

The sample size was 90 as there were drugs and placebo available for 90 patients. From Table,

reading down from α(two-sided) =0.05 and β=0.20 (the rightmost column), 44 patients per group are required to detect a standardized effect size of 0.6, which will enable us to detect a difference of 20% or more in FEV1 between two treatment groups.

A total of 105 patients were screened for the study and out of them 90 patients were enrolled in the study. But 10 patients dropped. We could not contact them. Finally there were 80 patients.

This was Hospital based randomized, double blind, double dummy, parallel group study. The patients were assigned into two groups (by random table). 45 number picked from random table were assigned group A and the rest were assigned group B.

Patients were required to have a clinical diagnosis of COPD according to the ATS criteria and stable airways obstruction. Only clinically clean cases without any complications were selected for this study.

Criteria of Inclusions:

1. Respiratory symptoms (cough, shortness of breath and sputum productions) for more than 1 year.
2. Patients were required to be a smokers and have at least of 10 pack-yr smoking history
3. Clinically stable airway obstruction
4. A forced expiratory volume in one second (FEV1) of < 80% of predicted normal values and a ratio of FEV1 to Forced Vital Capacity (FVC) of <70

Criteria of Exclusion:

1. If patients had a history of asthma, allergic rhinitis, atopy, or an increased total blood eosinophil count (>600 cells/cmm),
2. A significant disease other than COPD,
3. A recent history of myocardial infarction (<1yr), heart failure (<3yr) or cardiac arrythmia requiring drug treatment.
4. If the patients require regular daytime supplemental oxygen or were on doses exceeding the equivalent of 10 mg prednisone daily during the month prior to entering the study
5. Have had an upper respiratory tract infection in six weeks before screening.
6. Patients with a known hypersensitivity to anticholinergic drugs,

In the first phase, informed consent of the patient was obtained. A standard proforma was designed to fill up. The patients were identified as per inclusion and exclusion criteria.

A detailed history was taken, it was recorded in the proforma. In the second phase, a thorough physical examination was performed for pre-treatment assessment of patients.

After history taking and physical examination, following baseline investigations were done for full assessment of the patients. Base line investigations, that is data collected on day 1 prior to the administration of the study medication include

- Complete Blood count including total circulating eosinophil count.
- Sputum for
  - Eosinophil count
  - Acid Fast Bacilli
- Chest X-Ray (P-A view)
- PEFR (the best of the three measurements were taken)
- Spirometric evaluation for evidence of airway obstruction, and before and after salbutamol inhalation (2 puffs, 200 μgm) for reversibility :
  - FEV1 the best of three measurements were taken
  - FVC the best of three measurements were taken
  - FEV1/FVC

Study Design

The study had a run in period of one week and a treatment period of 6 weeks. FEV_1 and FVC measurements were performed after the first dose and after 8, 21, and 42 days of treatment. The patients continued to take the permitted medication for their COPD in stable doses, including methylxanthines, inhaled steroids, oral steroids up to 10 mg prednisone per day, and mucolytics. Long acting inhaled β_2 agonists, oral β_2 agonists, and cromolyn sodium were not allowed during the run in period as well as throughout the

study period. Anticholinergics were allowed during the run in period but were discontinued at the randomization visit. Patients were given open label salbutamol to use as rescue medication as necessary. They were allowed to increase or add oral steroids for two periods of seven days if necessary during exacerbations. At the randomization visit patients received either tiotropium 18 μg once daily + ipratropium matched placebo four times daily, or tiotropium matched placebo once daily + ipratropium 40 μg four times daily. Tiotropium was inhaled from the pMDI between 08.00 and 10.00 hours. Ipratropium (two puffs of 20 μg) was inhaled from a pMDI between 08.00 and 10.00 hours, at lunch, dinner, and when going to bed. Half of the patients were randomised into the tiotropium group and half into the ipratropium group.

Patients were given peak flow chart & were instructed to record the best recording out of 3 in morning and evening. In each visit patients peak flow chart was evaluated and physical examination was done and evaluated for any adverse effect.

The data collection through the above mentioned procedure were recorded systematically. All the data were collected from questionnaire forms and proforma. These data were then analyzed statistically by standard procedure to arrive at a definitive conclusion in respect to the objectives of the study. P value <0.05 was taken as significant in all analysis. Results were analyzed by conventional Chi-square test or Student's 't' test as applicable. Student 't' test was used to compare the quantitative difference between the groups and within the groups, viz. PEFR, spirometry analysis, etc. This quantitative data were presented in the table as mean ± standard error of mean (mean ± SEM). A chi-square analysis was done to compare the qualitative improvement and/or difference between groups.

Results

This was a prospective comparative study conducted in National Institute of Chest Disease and Hospital for a period of two years starting from January 2005 to December 2007. The main objective of the study was to assess the bronchodilator efficacy of Inhaled Tiotropium 18μgm/day and Inhaled Ipratropium 40 μgm 4 times a day in patients with COPD. Initially 105 patients were screened for the entry into the study. Of them 15 were not eligible for the study. Of the remaining 90 patients 45 were assigned to group A and the rest in group B. Patients in group A were treated by Inhaler Triotropium once daily + inhaled ipratropium matched placebo four times daily and the rest were treated tiotropium matched placebo once daily + ipratropium 40 μg four times daily.

Ten patients withdrew from the study before the completion. 2 for no contact, 1 for Lack of efficacy, 1 for adverse event, one for protocol violation in group A and 2 for no contact, 1 for adverse event, 1 for protocol violation and 1 for other reason. The withdrawal rates were similar in the two treatment groups-11.1% in both group.

Table-I

Age distribution of the study patients

Parameters	Study Patients				Total (N=90)		P value
	Group A(n=45)		Group B(n=45)				
Age in years	No	%	No	%	No	%	
<50	4	8.9	11	24.4	15	16.7	
<50-59	16	35.6	14	31.1	30	33.3	
60-69	16	35.6	13	28.9	29	32.2	
>70	9	20.0	7	15.6	16	17.8	
Mean±SD	60.62±10.03		57.24±10.26		58.93±10.23		0.118

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from unpaired student's t test

The mean age of the patients was 58.93±10.23years. The mean age of the group A patients was 60.62±10.03 and group B patients was 57.24±10.26 years and the mean age difference was not statistically significant (p >0.05) though the mean age of the group A was a little bit higher than the group B patients.

Among group A, the highest percentage was male (95.6%) and only 4.4% was female. Similarly in group B patients, highest percentage was male (97.8%) and only 2.2% female No statistically significant sex difference was found between two groups of patients (p>0.05).

Among the studied patients the highest percentage was farmer (27.8%) followed by Service holder (22.2%), Retired person (17.8%), Businessman (15.6%), Teacher (13.3%) and Housewife (3.3%). Analysis found no statistically significant difference of occupation between two groups of patients (p>0.05)

Among the studied patients the highest percentage was graduate (30%) followed by illiterate (25.6%), above graduate (17.8%), primary (13.3%) and secondary (13.3%) level of education. Analysis found no statistically significant difference of occupation between two groups of patients (p>0.05)

Table-II

Sex Distribution of the study patients

Parameters	Study Patients				Total (N=90)		P value
	Group A (n=45)		Group B (n=45)				
Sex	No	%	No	%	No	%	
Male	43	95.6	44	97.8	87	96.7	
Female	2	4.4	1	2.2	3	3.3	0.500

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from chi square test

Table-III

Distribution of the study patients by Occupation

Occupation	Study Patients				Total (N=90)		P value
	Group A (n=45)		Group B (n=45)				
	No	%	No	%	No	%	
Service holder	10	22.2	10	22.2	20	22.2	0.906
Businessman	6	13.3	8	17.8	14	15.6	
Teacher	7	15.6	5	11.1	12	13.3	
Retired	9	20.0	7	15.6	16	17.8	
Housewife	2	4.4	1	2.2	3	3.3	
Farmer	11	24.4	14	31.1	25	27.8	

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from chi square test

Table-IV

Distribution of study patients by smoking history in packyear

Duration of smoking in pack year	Study Patients				Total (N=90)		P value
	Group A (n=45)		Group B (n=45)				
	No	%	No	%	No	%	
<20	4	8.9	8	17.8	12	13.3	0.432
20-29	24	53.3	26	57.8	50	55.6	
30-39	15	33.3	10	22.2	25	27.8	
40+	2	4.4	1	2.2	3	3.3	
Mean±SD	29.27±8.40		26.32±7.23		27.80±7.93		

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from chi square test

Table-V

Distribution of study patients by duration of illness of COPD

Duration of illness (in years)	Study Patients				Total (N=90)		P value
	Group A (n=45)		Group B (n=45)				
	No	%	No	%	No	%	
1-2	13	28.9	14	31.1	27	30.0	0.725
3-4	15	33.3	16	35.6	31	34.4	
5-6	7	15.6	9	20.0	16	17.8	
>7	10	22.2	6	13.3	16	17.8	
Mean±SD	4.33±2.51		3.89±2.32		4.11±2.41		

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from chi square test

Table-VI

Distribution of study patients by previous treatment history

Prestudy medication (in years)	Study Patients				Total (N=90)		P value
	Group A (n=45)		Group B (n=45)				
	No	%	No	%	No	%	
Anticholinergic	30	66.7	29	64.4	59	65.6	0.824
Short acting β_2 agonist	38	84.4	41	91.1	79	87.8	0.334
Long acting $\beta_2$agonist	12	26.7	15	33.3	27	30.0	0.490
Theophyline	22	48.9	20	44.4	42	46.7	0.673
Oral Steroid	8	17.8	11	24.4	19	21.1	0.438
Inhaled Steroid	17	37.8	21	46.7	38	42.2	0.393

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from chi square test

Table-VII

Distribution of study patients by PEFR, FEV1, FVC, FEV1/FVC

Parameter	Study Patients		Total (N=90)	P value
	Group A(n=45) Mean ±SD	Group B (n=45) Mean ±SD	Mean ±SD	
PEFR (L/min)	244.07±20.89	249.18±19.09	246.63±20.06	0.229
FVC (L)	2.3±0.30	2.39±0.29	2.34±0.3	0.137
FVC(%)	65.13±2.1	65.61±1.8	65.37±2.0	0.256
FEV1	1.33±0.29	1.39±0.29	1.36±0.29	0.335
FEV1(%pred)	47±5.8	47±5.4	47±5.5	0.83
FEV1/FVC %	57±8	57±7	57±7	0.954

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from unpaired student's t test

Table-VIII

Difference of Trough FVC, FEV1 and PEFR of study patients on Day 8

Parameter	Study Patients		P value
	Group A(n=43) Mean ±SD	Group B (n=43) Mean ±SD	
Difference of Trough FVC(L) on day 8	0.0702±0.013	0.0235±0.011	<0.001
Difference of Trough FEV1(L) on day 8	0.0581±0.012	0.0095±0.004	<0.001
Difference of Trough PEFR(L/m) on day 8	6.5349±1.39	2.0930±0.81	<0.001

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from unpaired student's t test

The mean difference of Trough FVC, FEV1 and PEFR at the end of day 8 was 0.0702±0.013, 0.0581±0.012, 6.5349±1.39 respectively in group A and 0.0235±0.011, 0.0095±0.004 and 2.0930±0.81 respectively in group B. The statistical analysis shows the difference of the both group is statistically significant (p<.001).

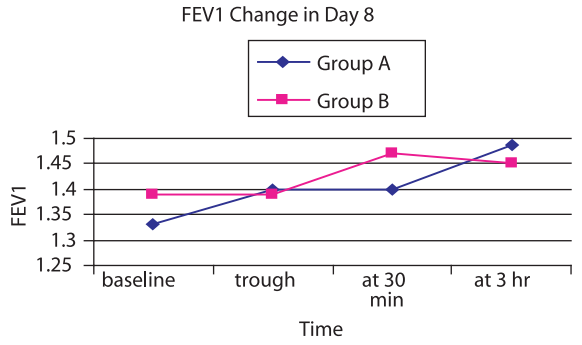

Fig.-1: *FEV1 at baseline, trough, 30 min and 3hr after taking medication in both group on Day 8.*

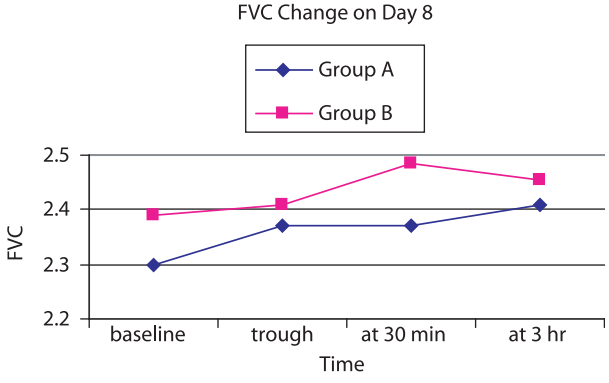

Fig.-2: *FVC at baseline, trough, 30 min and 3hr after taking medication in both group on Day 8*

Table-IX

Difference of Trough FVC, FEV1 and PEFR of study patients on Day 21.

Parameter	Study Patients		P value
	Group A(n=41) Mean ±SD	Group B (n=41) Mean ±SD	
Difference of Trough FVC on day 21	0.0810±0.013	0.0241±0.010	<0.001
Difference of Trough FEV1 on day 21	0.0617±0.013	0.0095±0.004	<0.001
Difference of Trough PEFR on day 21	6.9756±1.46	2.0488±0.77	<0.001

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from unpaired student's t test

The mean difference of Trough FVC, FEV1 and PEFR at the end of ay 21 was 0.0810±0.013, 0.0617±0.013, 6.9756±1.46 respectively in group A and 0.0241±0.010, 0.0095±0.004 and 2.0488±0.77 respectively in group B. The statistical analysis shows the difference of the both group is statistically significant (p<0.001).

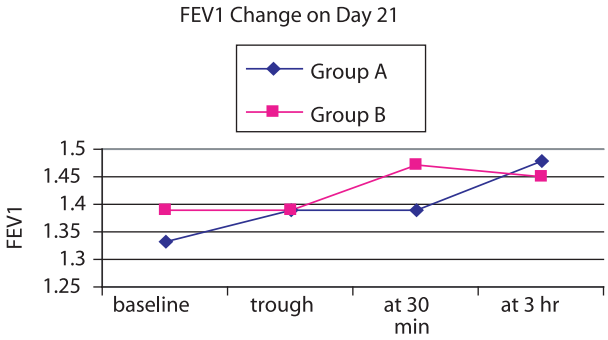

Fig.-3: *FEV1 at baseline, trough, 30 min and 3hr after taking medication in both group on Day 21*

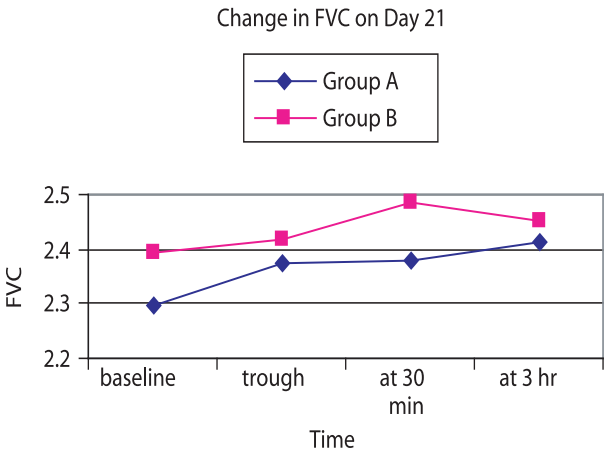

Fig.-4: *FVC at baseline, trough, 30 min and 3hr after taking medication in both group on Day 21*

Table-X

Difference of Trough FVC, FEV1 and PEFR of study patients on Day 42 (At the end of study).

Parameter	Study Patients		P value
	Group A(n=39) Mean ±SD	Group B (n=41) Mean ±SD	
Difference of Trough FVC on day 42	0.0910±0.014	0.0263±0.011	<0.001
Difference of Trough FEV1 on day 42	0.0772±0.012	0.0095±0.004	<0.001
Difference of Trough PEFR on day 42	7.1282±1.51	2.0488±0.77	<0.001

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium

Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium

p value reached from unpaired student's t test

The mean difference of Trough FVC, FEV1 and PEFR at the end of ay 42 was 0.0910±0.014, 0.0772±0.012, 7.1282±1.51 respectively in group A and 0.0263±0.011, 0.0095±0.004and 2.0488±0.77 respectively in group B. The statistical analysis shows the difference of the both group is statistically significant (p<.001).

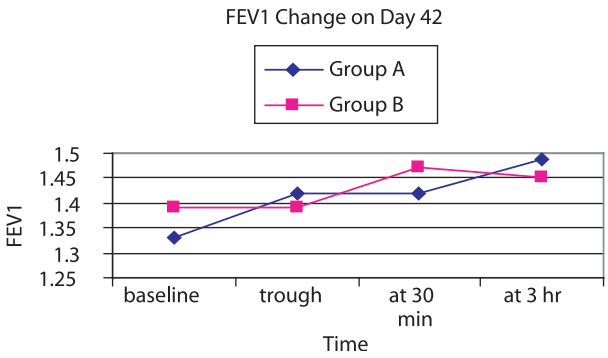

Fig.-5: *FEV1 at baseline, trough, 30 min and 3hr after taking medication in both group on Day 42*

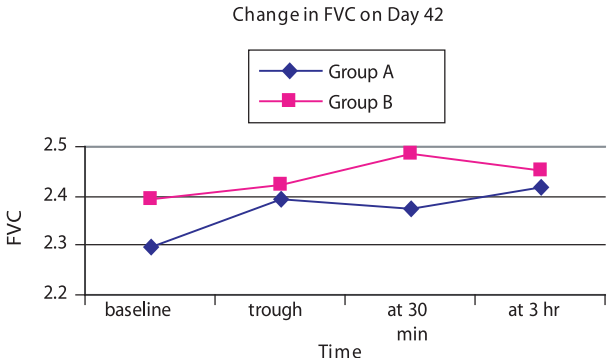

Fig.-6: *FVC at baseline, trough, 30 min and 3hr after taking medication in both group on Day 42*

MINI COPD Quality of Life Score

Each patient was evaluated by Three 7 scale questionnaire for COPD related Quality of Life as 0 for Never, 1 for almost never, 2 for a little of the time, 3 for some of the time, 4 for a good bit of time, 5 for Most of the time and 6 for All of the time. And One 5 scale questionnaire where 0 for Not at all, 1 for Slightly limited, 2 for Moderately limited, 3 for Quite a bit limited and 4 for Extremely limited. Another 5 scale questionnaire where 0 for not at all, 1 for Mildly, 2 for Somewhat, 3 for Moderately and 4 for Severely. In another questionnaire 0 for not at all, 1 for Mildly, 2 Moderately, 3 for Severely and 4 for I could not do activities at all. A questionnaire also with 5 scale had 0 for excellent, 1 for Very good, 2 for Good, 3 for Fair and 4 for Poor.

The Mean Mini COPD health score at the end of the study was done. The score was 51.38±1.29 in group A and 53.44±2.08 in group B. The difference is statistically significant (p<.001).

Concomitant daily use of β_2 agonist was 1.49±0.63 in group A and 1.26±0.54 in group B. Though the use was a bit higher in group A but it was not statistically significant (p>.05).

Table-XI

Mean distribution of Mini COPD health score and concomitant use of â$_2$ agonist of study patients on Day 42 (At the end of study).

Parameter	Study Patients Group A(n=39) Mean ±SD	P value Group B (n=41) Mean ±SD	
Mini COPD health score	51.38±1.29	53.44±2.08	<.001
Concomitant daily use of β_2 agonist	1.49±0.63	1.26±0.54	.070

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from unpaired student's t test

Table-XII

Mean difference of trough and evening PEFR on Day 8, 21 and 42.

Parameter	Study Patients Grpoup A(n=39) Mean ±SD	Group B (n=41) Mean ±SD	P value
Difference of morning and evening PEFR on day 8	2.18±0.70	1.00±0.53	<0.001
Difference of morning and evening PEFR on day 21	1.88±0.56	1.00±0.53	<0.001
Difference of morning and evening PEFR on day 42	1.41±0.50	1.00±0.53	<0.001

Group A : Patients treated by Inhaler Tiotropium + Placebo of Ipratropium
Group B : Patients treated by Inhaler Ipratropium + Placebo of Tiotropium
p value reached from unpaired student's t test

The mean difference between trough and evening PEFR gradually decreased from day 8 to day 42 as the evening PEFR gradually increased through this period as compared to trough PEFR in group A which was 2.18±0.70, 1.88±0.56 and 1.41±0.50 respectively on day 8, day 21 and day 42 . But it group B the difference remained the same 1.00±0.53 throughout the study as the trough as well as evening PEFR remained almost static during this period. The difference of the mean was statistically significant (p<0.001).

Discussion

This prospective study was done in which the bronchodilator effect of tiotropium has been investigated and directly compared with that of ipratropium in patients with moderate to severe airflow obstruction due to COPD.

The variables studied were trough FEV1, PEFR, FVC, post bronchodilator FEV1, PEFR, FVC at 30 min and 3 hr, concomitant use of inhaled â2 agonist and Mini COPD Quality of Life Score.

Initially 105 patients were screened for entry into the study. Of them 15 were not eligible for the study as they did not met the inclusion criteria. Total ninety patients were included in the study. The study patients were divided into two groups by picking forty five from random table and were assigned group A and the rest became group B. Patients in group A were treated by Inhaler Triotropium once daily + inhaled ipratropium matched placebo four times daily and the rest were treated by tiotropium matched placebo once daily + ipratropium 40 μg four times daily in group B.

Ten patients withdrew from the study before its completion, 2 for no contact, 1 for lack of efficacy, 1 for adverse event, one for protocol violation in group A and 2 for no contact, 1 for adverse event, 1 for protocol violation and 1 for other reason. The withdrawal rates were similar in the two treatment groups, 5 in each group (11.1%).

The prospective study was conducted in outpatient department of the National Institute of Disease of the Chest & Hospital, Dhaka, for a period of two years, starting from January 2005 to December 2006.

The mean age difference was not statistically significant though the mean age of the group A was a little bit higher than the group B patients.

Van et. al, 2000 on behalf of the Dutch Tiotropium Study Group showed age of Tiotropium group was 64 ± 8 and Ipratropium 65±8. It is consistent with my study.

It indicates that most patient with COPD seek medical attention when they are between 50-69 year.

Regarding sex, in both groups, the highest percentage were male (95.6%) and (97.8%) respectively and only 4.4% and 2.2% were female respectively. No statistically significant sex difference was found between two groups of patients.

The high male predominance which also found in other studies done in Bangladesh on COPD patients (1, 2) may be due to increased smoking habits among males, also male are more exposed to external environment. Atmospheric pollution and smoking are two principal predisposing factors for COPD. Females were found least affected in the study probably due to

- Few females smokers in this country
- Most were housewives
- Had a sheltered mode of life and
- Less exposure to occupational dust and fumes.

But in western world, male female difference in cigarette consumption is narrow, thereby existing sex differences in the prevalence of COPD is expected in our society due to lack of smoking habit in female in our society.

No statistically significant difference in mean body mass index was found between two groups of patients. Regarding height and weight there is also not significant difference between the two groups.

Though the mean weight and height were lower than Van et al 2000 but it is consistent with other studies done in Bangladesh[2].

Peoples who suffer from cough don't give importance to the disease and usually don't come to a doctor or take medicine from pharmacy to suppress the cough. They usually don't recognize the symptom as a disease unless it becomes severe or becomes associated with breathlessness. This attitude come out in our study with the mean duration of symptom before coming to a chest physician or Chest institute. The mean duration of symptom were measured. The mean duration of illness was a little bit higher in group A as compared to group B. The difference was not statistically significant. It could be due to ignorance of patients regarding the disease. They also tried to get treatment from local doctors.

Van et. al, 2000 on behalf of the Dutch Tiotropium Study Group showed mean history of smoking of Tiotropium group was 33±16 pack year and Ipratropium 35±19 pack year. It is consistent with our study.

As this is well recognized fact that smoking is the principal risk factor for the development of COPD, we also tried to find out the smoking history—its duration as well as number of stick consumed expressed in pack year. The mean smoking history of patients in group A was 29.27±8.4 and for group B was 26.32±7.23. Though it is a little lower in our study groups but analysis revealed no statistically significant difference in smoking history, though the mean smoking history was a little bit higher in group A compared to group B.

It is clear that COPD does not have a single cause and that multiple factors must act in combination for the disorder to become clinically evident. Cigarette smoking is the principal identified risk factor in the causation of COPD, yet only a minority of persons who smoke develop COPD while an occasional lifelong nonsmoker may develop severe disease. Other factors are clearly operative, but their identity remains largely unknown. There is widespread concern that noxious fumes, dust and smoke encountered in the workplace may permanently impair ventilatory function and contribute to the development of COPD.

For most occupational exposures, the risk of developing COPD appears to be more pronounced in those workers who also smoke cigarette. In general, the magnitude of the occupational effect is substantially less important that the smoking effect and occupation alone would rarely lead to the development of clinically apparent COPD[3].

Analysis found no statistically significant difference of occupation between two groups of patients. Educational background is important on giving information to the patients. Though there is less percentage of patients from less educated group but the awareness of the disease and tendency for

seeking medical help among relatively less educated group was not far behind than the relatively well educated people which are consistent with[2].

During questioning we found before coming to a chest hospital or chest physician the patients tried different medication from various advice—from local village doctor and also qualified doctor. But treatment regimen was very much faulty. Those with lack of knowledge of latest guidelines and also fear of using inhaler was obvious from the previous treatment history.

It was found that all the patients (both the groups) had history of taking various types of bronchodilator drugs prior to attending the hospital but the difference was not statistically significant. And about Long acting beta agonist, both the group had history of taking this drug, the difference was not statistically significant. Patients also had history of taking anticholinergic drugs, the difference was not statistically significant. Regarding oral theophyline use the difference was not statistically significant. Regarding the use of oral steroid, only 17.8% in group A patients and 24.4% in group B patients had previous history of taking oral steroid. And about inhaled steroid 37.8% in group A had history of taking the medicine while 46.7% in the group B had the same, the difference is not statistically significant. They took drugs irregularly and inhaler technique was mostly incorrect. It also indicates that the disease is progressive and irreversible.

The peak expiratory flow, forced vital capacity and forced expiratory volume in one second before bronchodilator were recorded before day 1 of the study as baseline measure. The parameters were also measured after bronchodilation with short acting beta 2 agonist.

The mean baseline peak expiratory flow, forced vital capacity and forced expiratory volume in one second were measured in both the groups of patients. Analysis found no statistically significant mean differences between two groups of patients.

The percentage of FVC, percentage of FEV1 of predicted and FEV1/FVC were measured in both the groups of patients. The differences are not statistically significant.

The mean post bronchodilator peak expiratory flow, forced vital capacity and forced expiratory volume in one second were measured in both the groups. Analysis found no statistically significant mean differences between two groups of patients.

The percentage of change of FEV1 was 6.88±2.3 and 6.64±1.7 in group A and in group B respectively which is less than 12%.

In the present study, the pulmonary functions were evaluated by measuring the PEFR in L/min, FEV1 in L, FVC in L.

The mean difference of Trough FVC, FEV1 and PEFR from baseline which was our primary end point was measured at day 8, day 21 and day 42.

The difference of trough FVC, FEV1 and PRFR from baseline were better and statistically significant in group A

There is a small increase in all parameter which is consistent with (4).

18 μg tiotropium once daily via metered dose inhaler achieved a significantly greater improvement in trough values of FEV1, FVC and PEFR than 40 μg ipratropium four times daily at the end of day 8, 21 and 42.

These data confirm the results of previous single dose studies (5) that tiotropium has a bronchodilating effect of at least 24 hours.

During the maintenance therapy with tiotropium the values of FEV1 and FVC never returned to baseline values. There was still an improvement in trough FEV1 and FVC response 24 hours after the previous dose. Measurements after the first doses of both compounds showed that ipratropium had a more rapid onset of action than tiotropium. However, during maintenance therapy this difference was no longer of importance, as the "acute on chronic" effect of tiotropium achieved almost equal bronchodilation to ipratropium. The effect also observed by Van et al[4].

Furthermore, after both tiotropium and ipratropium the improvements in FVC were similar to those in FEV1. It is generally thought that anticholinergic agents produce their bronchodilating effect mainly in the central airways. Nevertheless, this increase in FVC might be interpreted as a diminution of air trapping and of closure of the small airways.

It is known that in COPD the relationship between PEF and FEV1 is poor and PEF may underestimate the degree of airways obstruction because of the airway collapsibility present in this disorder.

However, serial PEF measurements are of value in assessing treatment response. Using weekly means of PEF recordings in the tiotropium group steady state was reached after three weeks and sustained during the treatment period, whereas in the ipratropium group PEF showed a significant difference in between morning and evening PEF during the 6 week.

In keeping with the results of the clinical lung function, improvement in morning and evening PEF monitored at home and the difference between evening and morning (trough) PEF calculated.

Patients were given Peak flow meter to monitor morning (before taking drug) and evening (before taking drug) himself regularly. This was designed to find the duration of bronchodilating effect of both drug.

The effect of tiotropium remains for 24-36hr. As a result it elevates the value of PEFR during evening as well as next days trough PEFR values. But as the duration of effect for ipratropium is 6-8hr and taking it 6 hourly becomes prblematic for the patient we found the following observation.

The mean difference between trough and evening PEFR gradually decreased from day 8 to day 42 as the evening PEFR gradually increased through this period as compared to trough PEFR in group A. But in group B the difference remained the same throughout the study as the trough as well as evening PEFR remained almost static during this period. The difference of the mean was statistically significant. The results are consistent with study of [5].

However, we are aware that, in addition to spirometric indices there are outcome parameters. In addition to pulmonary function COPD affects the physical, social and emotional aspects of patients lives. Each patient evaluated by 7 scale questionnaire for COPD—"Mini COPD health score". The difference in score is statistically significant and better in Tiotropium group.

Concomitant use of rescue salbutamol is regarded as an indicator of disease control. So, we decieded to study the use of concomitant salbutamol. It is found that the concomitant use of â2 agonist use was a little high in group A than group B. But the difference of which is not statistically significant and consistent with[5] study.

At present the official GOLD guideline (6) recommend regular use of anticholinergics as first line treatment in patients with COPD suffering from continuing symptoms. The present study shows that tiotropium has important and significant advantages over ipratropium. Tiotropium is more potent, has a longer duration of action, and is able to produce a permanent improvement in baseline lung function. It allows once daily dosing which is convenient for patients with COPD and may enhance compliance with treatment.

Limitations

One limitation of the present study is that study population is limited in number. More the number of patients, more convincing will be the result. Another limitation of the present study is the absence of a placebo group. This procedure involves expensive apparatus like spirometry which requires external source of energy (i.e. Electricity)

Strength of the study

The study was double blind, double dummy and parallel group study. The study period was 6 week by which time the effect of tiotropium reaches steady state. Both subjective and objective improvement of patient was measured.

In conclusion, 18 µg tiotropium once daily was significantly more effective than 40 µg ipratropium four times daily in improving trough and peak lung function over the 6 week treatment period. These data support the use of tiotropium as first line treatment for the long term maintenance treatment of patients with airflow obstruction due to COPD.

Conclusion

So, in conclusion Tiotropium in a dose of 18 µg inhaled once daily MDI was significantly more effective than 40 µg ipratropium four times daily in improving trough PEFR, FEV1 and FVC as well as Mini COPD health score over 6 weeks period. These data support the use of tiotropium as first line treatment for the long term maintenance

treatment of patients with airflow obstruction due to COPD.

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ORIGINAL ARTICLE

Surgery in Carcinoma of Oesophagus A Study in NIDCH

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Abstract:

Surgery offers the the best prospect of cure in patients with Ca esophagus who present at an early stage of the disease and the best palliation for dysphagia even if complete cure is not possible. The prime aim of operation should be to remove the ulcerating growth that lies in direct communication with mouth and to restore swallowing. If at the same time a satisfactory cancer is obtained it should regarded as bonus .A mortality of 10% is surgically acceptable and the extention of life by1 to2 yrs is a real benefit to an elderly patient. Surgery for Ca esophagus are only carried out in the National Institute of Diseases of the Chest and Hospital (NIDCH). This study was carried out in 27 Ca esophagus patients who underwent surgery in SU-II,NIDCH from January 2007 to April 2008. The total number of surgery in all units exceeds100 during this period. It is concluded that surgery in Ca esophagus was successfully done in these patients and other aspects the surgery (3 stage operation, stapling device) should be considered in future.

[Chest & Heart Journal 2008; 32(2) : 87-91]

Introduction:

Oesophageal cancers are highly lethal neoplasms. Despite advances in multimodality therapy, 5 year survival generally remains less than 10%. Although the incidence of squamous cell carcinoma of the oesophagus has remained stable, the incidence of primary oesophageal adenocarcinomas has steadily increased[4]

Cancers of the oesophagus was apparently first described more than 2000 years ago in the high incidence regions of China[9]. Few accurate reports of oesophageal malignancy were forthcoming, however, until the late 1800s, when improved pathological descriptions paralleled initial attempts at surgical resections of cervical oesophageal tumours. Epidemiologic reports following World War II stressed the striking geographic variations in incidence of oesophageal cancer[4]

Carcinoma of the oesophagus is one of the most common malignancies worldwide[6]. The epidemiology of the disease is characterized by geographic variations in incidence, not only between countries, but also within distinct geographic regions and among ethnic groups. High incidence areas are China, temperate South America, western Europe, southern Africa, Japan & the former Soviet Union. Low incidence areas include middle, western & northern Africa, central America, western Asia & Polynesia[2]

The etiology of oesophageal cancer is unknown. As for other human solid tumours, oesophageal cancers are thought to arise as a multistep process, modulated by both genetic and environmental factors. Epidemiologic studies from high incidence geographic areas suggest an association between various environmental factors and the development of oesophageal tumours. Alcohol & tobacco, diet & nutritional deficiencies have consistently been implicated, but the relative influence of each factor appears unique to the

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region studied[3]. Again it is unlikely that a single etiologic factor could account for the marked variation in frequency of this disease worldwide. The possibility of genetic events underlying the development of oesophageal cancer arose from several observations[4]

One of the earliest descriptions of oesophageal cancer was in the second century AD, when Golen described a fleshy obstructing growth in the oesophagus that was responsible for the inability to swallow and that led to emaciation & death. In 10th century Avicenna described various conditions leading to dysphagia of which tumour were a common cause.

Surgery of the oesophagus began with the first recorded procedure by the Egyptians in 2500 BC when "repair of the gullet" after perforation was reported. The history of oesophagectomy for cancer was well narrated by Brewer. In 1877, Czerny performed the first successful resection of a cervical oesophageal cancer. Rehn carried out the first, although unsuccessful, attempts at resection of thoracic oesophageal cancer in 1898. It was Torek who, in 1913, performed the first successful tansthoracic resection. The high mortality rates associated with transthoracic resections led to attempts at using different techniques of oesophagectomy. The transhiatal approach to oesophageal resection was introduced by Denk in 1913 & refined by Turner in 1931. The first successful resection of a thoracic oesophageal cancer with reconstruction using the stomach was performed by Ohsawa in Kyoto, Japan. In 1946, Ivor Lewis described oesophageal resection using a two-phase approach via a right thoracotomy and laparotomy. Tanner independently also described the procedure in 1947. Since then other methods of reconstruction, including the use of colon & small bowel, have been described. The first surgeon to use a free jejunal graft for reconstruction was Seidenberg, who reported his experience in 1959 [3] .

Surgery has been the mainstay of treatment of oesophageal cancer against which other modalities should be compared. Surgery is justified only when acceptably low morbidity and mortality rates can be achieved even for advanced disease[8]. Initial management of adenocarcinoma of the oesophagus and oesophago-gastric junction is directed toward determining the resectibility of the tumour and operability of the patient[2]. Surgical therapy for carcinoma of the oesophagus and oesophago-gastric junction has evolved along the principles of complete resection of the tumour, the abnormal oesophagus & the draining lymph nodes. Swallowing is restored by the interposition of the stomach, small bowel or colon. Tumours of the oesophago-gastric junction can be resected by (1) total gastrectomy with Roux-en-Y intestinal reconstruction, (2) partial oesophago-gastrectomy through a left thoracotomy incision of the diaphragm, (3) left thoraco-abdominal incision or (4) transhiatal oesophago-gastrectomy with gastric interposition to the neck[1].

Cancers of both the upper & middle thoracic oesophagus can be resected by laparotomy and right thoracotomy with interposition of the stomach to the oesophagus in the upper chest or laparotomy, right thoracotomy and cervical incision with oesophago-gastric anastomosis in the neck. Radical oesophago-gastrectomy may improve survival for patients with advanced disease [2]. The mainstay of curative therapy is surgical resection. However fewer than 50% of patients present with disease confined to the oesophagus or regional lymph nodes and the remainder have evidence of distant spread. Patients who present with systemic metastases from oesophageal carcinoma are not candidates for curative resection. Yet they require palliation for their symptoms. It is important that palliative procedures have a low morbidity & mortality rate and work well in the short term. The symptoms requiring palliation result mainly from oesophageal obstruction or fistulization[4]. In cases of dysphagia oesophageal lumen may be restablished by oesophageal dialatation, laser fulguration, brachytherapy and/or external beam radiotherapy, chemo-radiotherapy or intubation, preferably with an expansile stent. In rare circumstances patients with a tracheo-oesophageal fistula may benefit from an oesophageal bypass or covered oesophageal or tracheal stent. Improvements of the quality of life is very important for these patients [1].

Despite the operative risks, surgery remains the primay mode of therapy for carcinoma of the oesophagus & oesophago-gastric junction because of the poor cure rate and persistence of symptoms after therapy with other modalities[1].

Results of surgical resection have improved over the years. There is no doubt that a significant learning curve exists for oesophagectomy, but in specialized centers with experience, it is now an operation of acceptable risk. Improvements in surgical outcome can be achieved by (1) identifying patients with prohibitively high risk & excluding them from surgery, (2) optimizing the patients' physiologic status for surgery, and (3) refinements of surgical technique & perioperative care.[3]

Great steps have been made in improving surgical results. Once an operation with the highest mortality, oesophagectomy has become a relatively safe procedure through improved selection of patients, well conducted operations and better peri-operative care. The long term prognosis in this disease, however, remains suboptimal.[3]

Materials and method

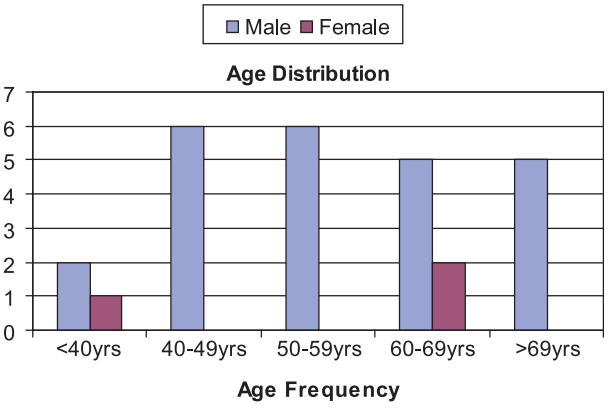
This was a prospective study carried out in SU- II, Department of Thoracic Surgery, NIDCH from 01-01-2007 to 30-04-2008. Ca esophagus is one of the common disease encountered in Thoracic Surgery and a major portion of patients with malignant diseases gets admitted in NIDCH for the treatment of ca esophagus.

During the above mentioned period 153 thoracotomy were carried out in SU-II & among them 27(17.65%) were operated for Ca esophagus.

Table-I

Age Distribution

<40yrs		40-49yrs		50-59yrs		60-69yrs		>69yrs		Total		Grand Total
M	F	M	F	M	F	M	F	M	F	M	F	
02	01	06	00	06	00	05	02	05	00	24	03	27
Total = 03		Total = 06		Total = 06		Total = 07		Total = 05				



Male and female ratio was 8:1.The male predominance may be explained by differences in exposure to carcinogen and health care seeking behavior between male and female. The male patients were 88.89% of the total patients while the female patients were11.11%.

Chief complains:

Progressive dysphagia————100%

Occasional regurgitation————95%

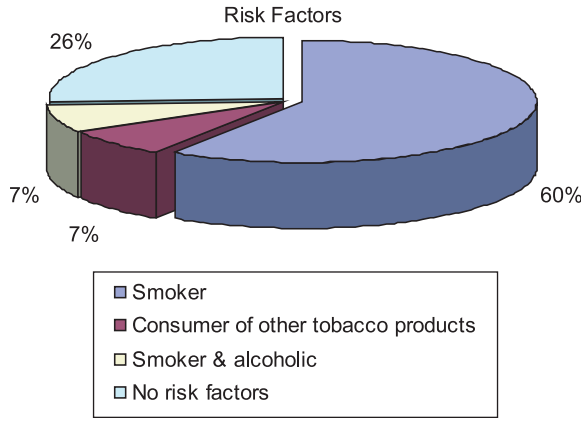
Anorexia and wt. loss————95%

Only one patient presented with malena.

Table-II

Risk Factors

Types	No. of patients	Percentage (%)
Smoker	16	60
Consumer of other tobacco products	2	07
Smoker & alcoholic	02	07
No risk factors	07	26



Eighteen patients were smokers & consumer of other tobacco products (66.66%),two were both smokers(7.40%) and alcoholic, but no risk factors were in seven patients.Among the smokers 09 patients gave family history of diseases of same signs &symptoms while 1(one) patient who was both smoker & alcoholic gave such history.Three of their family members were diagnosed as Ca esophagus and were treated with radio/ chemotherapy. Others were either maltreated or not treated at all.

Preoperative preparation:

Besides routine preparation like any other patients a patient with Ca esophaghus needs special measures because most of the patients are elderly and concomitant disease are likely to persist.Fifteen of the above mentioned patients were either hypertensive or diabetic or both&IHD. Almost all patients suffered from anaemia,electrolyte imbalance,hypoproteinaemia & others. These were all corrected.Special attention was given to cardiac compromised patients who needed special care per & postoperatively.

Table-III

Concomitant diseases

Types of diseases	No of pts	Percentage
Diabetes	10	37.03
Hypertention	05	18.51
IHD	05	18.51

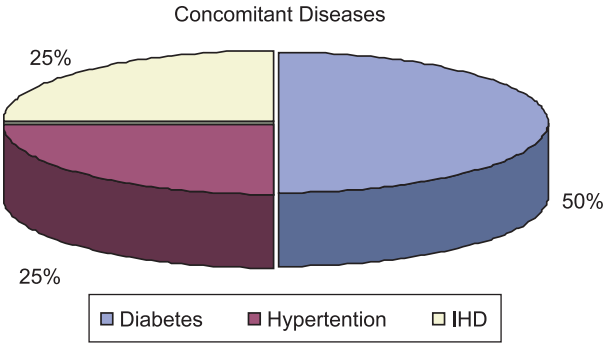
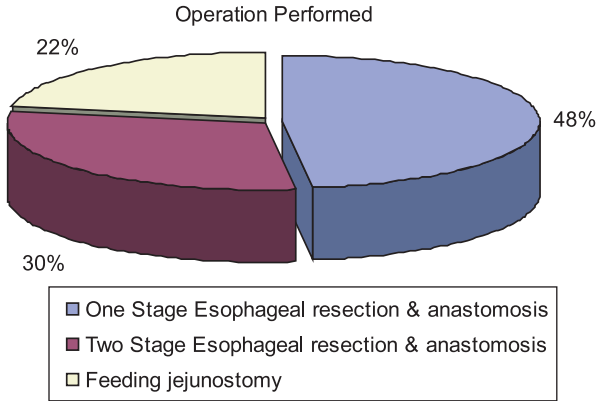


Table-IV

Operation Performed

One Stage Esophageal resection & anastomosis		Two Stage Esophageal resection & anastomosis		Feeding jejunostomy	
No.	%	No.	%	No.	%
13	48.15	08	29.63	06	22.22



All patients were preoperatively diagnosed as ca esophagus except in one patient where pre operative histopathological diagnosis was adenomatous polyp but popostoperative histopathological diagnosis was adenocarcinoma.Barium swallow esophagus& Ba meal x-ray of stomach in T position and preoperative findings only fundus or both fundus and part of body of stomach was involved in all cases.Feeding jejunostomy were done in cases where resection could not be done due severe adhesion to pancreas or aorta or both.Preoperative rigid esophagoscopy were done in patients where needed specially for planning of surgery.

Operative technique:

One stage esophageal resection &anastomosis was considered in those pts whose lesion was below 32cm from upper incisor teeth while those from 25cm to 32cm were considered for two stage.Though height of the patient & vertebral level of the lesion was an important consideration

One stage esophageal resection &anastomosis:

-Incision is given along the upper border of 8th rib cutting the posterior segment of 7th rib.

-After entering the thoracic cavity,inferior pulmonary ligament is dissected upto inferior pulmonary vein.

-Radial incision is given on the diaphragm upto esophageal hiatus

-The tumour mass is felt along with its extention &adhesion to surrounding structures.

-Esophagus is mobilized upto the desired length&asling is given.

-Stomach is mobilized by dividing the gastrocolic ligament &lesser ligament preserving the Rt gastric& Rt gastroepiploic artery.

-Appropriate amount of partial esophagogastrectomy is done along with the tumour mass.

- Stomach is closed in two layers

-Gastric stomas formed in a suitable place.Haemostasis is secured

-Esophagogastric anastomosis is done in two layers.

- Diaphragm is closed in two layers.

-Wound is closed in layers.

Two stage esophageal resection &anastomosis:

-Surgery of abdomen_upper midline incision

-After laperatomy assessment for resectectability is done.

-Stomach is mobilized as mentioned above.

-Desired portion of stomach is incised.

-Stomach is closed in two layers.

-Marking is given in greater curvature by 2/0 silkto avoid rotation.

-Hiatolysis is done& abdomen is closed in layers.

-Rt. Standerd lateral thoracotomy is done

-Azygos vein is ligated

-Medastinal pleura over esophagus is dissected

-Mobilisation of esophagus & a sling is given & stomach is pulled into thoracic cavity.

-Gastric stomas formed in a suitable place.Haemostasis is secured.

- Appropriate amount of partial esophagectomy is done along with tumour & esophago-gastrostomy is done.

In two cases one stage incision was turned into thoracoabdominal incisin for better exposure

In five cases artificial fundus was formed from the redundant portion of stomach. The result was same as others.

Patients were kept NPO for six days in propped up position along with nasogastric suction,maintainance of nutrion, electrolyte,Hb%& vitamin supplementation.On the 7th day contrast X-ray of esophagus was done to see any anastomotic leakage &/or water mixed with gention violet was given to the patient to see whether it appears in IT bag.

Histopathological diagnosis:

Adenonocarcinoma————17

Squamous cell carcinoma————10

Postoperative diagnosis correlated with preoperative diagnosis obtained by endoscopic biopsy except in one mentioned before. In 15 patients proximal and distal margins were free from tumour while in 06 patients distal margins were not free.

Follow up:

All patients were referred to NIRCH for radio/ chemotherapy.Patients were followed up one monthly for the first three months and then three monthly thereafter.About half (45%) of the patients led a symptom free life while others suffered from mild dysphagia, wt. loss, aspiration pneumonia, back pain and features of metastasis.

No patients suffered from anastomotic leakage after surgery

Recommendation:

1. Awareness about Ca esophagus should be highlihtened, so that surgery can be done in early stage
2. Facility of frozen section should be ensured for adequate resection
3. More communication is needed between onchologists and thoracic surgeons.
4. Use of staplers should be considered to save time & convenience.

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REVIEW ARTICLE

Device Closure of Atrial Septal Defect

Mohammad Shafiqur Rahman Patwary

Abstract:

Transcatheter closure of atrial septal defect and patent foramen ovale has become an accepted alternative to surgical closure with a cardiopulmonary bypass. Now a day in advance country, children with atrial septal defects would often require open-heart surgery to repair a hole in their heart. Cardiologists in advance country are avoiding surgery by using a new mesh device, delivered through a catheter, to treat this common congenital heart defect. This state-of-the-art technology closes the hole in the upper chambers of the heart. But in Bangladesh we are still depend on surgery. The use of various devices to close atrial septal defect and patent foramen ovale has been associated with high success and low complication rates. For optimal selection of patients and device deployment, however, Transesophageal echocardiography has become an essential and integral part of the closure procedure. Owing to the length of the catheterization procedure, especially in children, the closure usually is done under general endotracheal anesthesia. The recent introduction and approval of a 10F, 5.5- to 10-MHz ultrasound-tipped catheter with a vector phased array transducer encouraged us to test the feasibility of catheter closure of atrial septal defect and patent foramen ovale under intracardiac echocardiography guidance.

[Chest & Heart Journal 2008; 32(2) : 106-111]

Introduction:

The first attempt at transcatheter closure of a secundum atrial septal defect was reported in 1976[1]. Since the first description by King and Mills more than two decades ago [2] transcatheter closure of secundum atrial septal defects is increasingly used to avoid surgical closure with a cardiopulmonary bypass. Several devices are now available with different constructions and methods of implantation[3,4,5, 6] . Transcatheter closure of secundum atrial septal defects with the recently introduced self-centering device, the Amplatzer septal occluder, has become an accepted option for selected children with this condition[7,8].

The experience of transcatheter device closure of atrial septal defects is limited in adults, especially in those with large (> 26 mm) defects. The secundum-type atrial septal defect is the second most common congenital defect in adults, with a reported incidence of 22% among adults with congenital heart disease[9,10]. The defect also remains the most common cause of surgical repair in adults with congenital cardiac lesions[11] . In adults, untreated defects of the atrial septum may lead to serious complications. Secundum atrial septal defect can cause arrhythmia, pulmonary hypertension, and reduced life expectancy[12, 13 ,14]. Patent foramen ovale is associated with stroke, systemic embolism, and neurological decompression illness in divers [15,16,17,18]. Surgical closure of atrial septal defect in adults carries low mortality but significant morbidity[19 ,20,21]. The optimum nonsurgical management of patients with patent foramen ovale and embolism is unclear. Anticoagulation carries risk of hemorrhage, and its efficacy in stroke prevention is not proved[22]. Transcatheter closure of atrial septal defect is increasingly used in adults[19, 20, 23, 24]. The Amplatzer occluder is a second generation self-centering device which is a widely accepted treatment for atrial septal defect and patent foramen ovale[25,26]. Transcatheter atrial septal defect closure has become more widely practiced. Transesophageal echocardiography plays an important role in the selection of patients and as

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an imaging tool guiding device deployment[27]. Owing to the length of the procedure, however, the use of transesophageal echocardiography to guide device closure requires the patient to be under general anesthesia with or without endotracheal intubation. Intracardiac echocardiography, which provides the operator direct intracardiac visualization, has been used as a guiding tool during radiofrequency ablation and to facilitate transseptal puncture techniques[28] in complex cases. Recently, a new ultrasound-tipped catheter with tissue penetration of 12 cm has been approved and described[29] for intracardiac echocardiography.

Atrial septal defect :

Atrial septal defect is an abnormal hole in the wall of the upper chambers of the heart where the wall between the right and left atria does not close completely. The size of the hole and its exact location vary from patient to patient.

Atrial septal defect can increase the amount of blood that flows to the lungs. During childhood, there may be no symptoms, but over time the condition can lead to pulmonary hypertension or congestive heart failure.

Indications of atrial septal defect closure:

Indications for atrial septal defect closure were demonstration of a secundum atrial septal defect by echocardiography plus evidence of right ventricular volume overload, or peripheral arterial embolism or focal neurological event. Indications for patent foramen ovale closure were demonstration of a patent foramen ovale (of large size and/or aneurysmal septum) which permitted significant right-to-left shunting during contrast transesophageal echocardiography performed with Valsalva maneuver plus peripheral arterial embolism or focal neurological event (multiple cerebral defects confirmed by computed tomography and/or magnetic resonance imaging), or diving related decompression illness.

Atrial septal defect closure devices cannot be used:

- If the atrial septal defect is too large to be adequately closed by a catheter-based closure device
- If the particular patient's heart structure will not allow an atrial septal defect closure device to be used (for example, if there is not enough atrial septal tissue left to secure the device)
- If the particular patient's blood vessels are too narrow to allow the catheter-based delivery system to be used
- If the patient has blood clots in his/her heart
- If the patient needs surgery to fix other heart defects
- If the patient has a bleeding disorder, untreated ulcer, or is unable to take aspirin
- If the patient has an active infection anywhere in the body (the device can be implanted after the infection is completely gone)

Atrial septal defect closure devices :

Two main types of atrial septal defect closure devices are usually used the Amplatzer Septal Occluder System and the HELEX TM Septal Occluder.

Amplatzer Septal Occluder :

The Amplatzer septal occluder is a self-expandable, circular double disc frame with a central connecting waist corresponding to the diameter of the interatrial septal defect to be occluded, made of windings of a shape-memory metal (nitinol) wire [30,31]. These discs are made of polyester fabric encased by a wire mesh made of a nickel-titanium metal alloy. The size of the device is determined by the diameter of the waist. The device stents the actual defect and occlusion is achieved partly by thin Dacron patch inserts, but mainly by in situ thrombosis and subsequent endothelialization. The retention rims extend the device by 5–7 mm and retain the device in position. The device is attached to a delivery cable by a microscrew, and can be loaded into a long 7–11 French introducing sheath. The patent foramen ovale device consists of two nitinol discs joined by a narrow elongated connection, allowing the discs to align even in tunnel-like defects.

Helex Septal Occluder :

Consists of a circular wire frame made of a nickel-titanium metal alloy covered with a thin membrane made of Gore-Tex, a material that has been used in open-heart surgery for more than 20 years. Once the device is passed through the catheter it opens up to form one circular disk that covers the hole.

The HELEX Septal Occluder is an investigational device only currently available to patients enrolled in a clinical trial.

Procedures:

The procedures were performed under general anesthesia on 50% oxygen, to allow continuous multiplane transesophageal imaging of the atrial septum and related structures and fluoroscopic monitoring. Transesophageal echocardiography imaging was obtained using multiplane probe.Two operators and an experienced echocardiographer were involved in all cases. A complete hemodynamic study was carried out.Patients with anomalous pulmonary venous drainage were excluded. The stretched diameter of the defect was measured using a balloon-sizing catheter .and a device e"1–2 mm than this dimension was deployed. The defects were balloon sized using one of the two types of balloon catheters. With the Meditech Occlusion Balloon Catheter (Boston Scientific Corporation, Watertown, MA), the stretched diameter of the defect was defined as the diameter of a balloon that could be withdrawn through the defect with minimal resistance and slight deformity. With the Amplatzer Sizing Balloon (AGA Medical Corporation, Golden Valley, MN), the stretched diameter of the defect was measured by inflating the balloon within the defect, up to origination of a waist in the balloon. An occluder equal to, or 1–4 mm larger than the defect's stretched diameter was chosen. Patent foramen ovale closures were not sized by balloon. After placement, fixation of the device and its mechanical stability were proven by gentle pushing and pulling with the delivery cable (the "Minnesota Wiggle"). The occluder was released only when the echocardiogram showed a correct device position, and no or trivial residual color flow [32] . Intravenous heparin (100 U/kg) was given during the procedure followed by three doses (0.5 mg/kg) of subcutaneous low molecular heparin (Enoxaparin) every 12 hr, followed by 1 month of clopidogrel 75 mg daily and 6 months of aspirin 75 mg daily. Prophylactic antibiotics were given to cover the procedure and for dental and surgical procedures for 6 months after implantation. Transthoracic echocardiography was performed at 24 h, and 1, 3, and 6 months post implantation. Venous access for Amplatzer device delivery was from the right femoral vein. Introduction of the intracardiac echocardiography catheter was through a separate 11F sheath in the same femoral vein in adults or from the left femoral vein in the child. Complete evaluation of the defects and surrounding rims, measurement of the balloon stretched diameter of the defects for patients with secundum atrial septal defect and deployment of the device were done under transesophageal echocardiography. Intracardiac echocardiography also helpful for evalution of atrial septal defect. Intracardiac echocardiography imaging was obtained using ultrasound-tipped catheter. The catheter tip contains a 64-element vector phased-array transducer that scans in the longitudinal plane, providing a 90° sector image with tissue penetration of 12 cm. The unique advantages of this catheter include the presence of a four-way tip articulation for easy maneuverability inside the cardiac chambers and doppler capabilities. It is introduced via an 11F sheath from either the right or left femoral vein. After device deployment, transesophageal echocardiography and intracardiac echocardiography imaging may use for assessment of the closure result. Near field images obtained by intracardiac echocardiography were superior to those obtained by transesophageal echocardiography. Furthermore, we believe that intracardiac echocardiography imaging of the device inside the left and right atria and the relationship of the device to the superior vena cava was clearer than that obtained by transesophageal echocardiography, especially in the small child.

Follow-Up:

Prophylactic antibiotics were given to cover the procedure and for dental and surgical procedures for 6 months after implantation. Transthoracic echocardiography was performed at 24 h, and 1, 3, 6 and 12 months post implantation. After the implantation, a small diffuse residual leak through the central portion of the device could be seen in the majority of patients. Majority patients followed up for 1 year had the defects completely occluded.

Complications:

The use of various devices to close Atrial septal defect and patent foramen ovale has been associated with high success and low complication rates [33 , 34 , 35, 36, 37] . Patients may develop transient atrioventricular block, air embolus,

transient loss of vision, neurological deficit, residual shunt, thrombus formation, device embolization, wire fractures, obstruction of the pulmonary or systemic veins, or tricuspid or mitral regurgitation, arrhythmias and vascular access sheath complication.

Conclusions:

Atrial septal defect closure device is an efficacious method for transcatheter closure of interatrial defects in children and adults including large Atrial septal defect up to 38 mm in diameter. Transvenous occlusion of secundum atrial septal defects is safe, and can be performed without significant periprocedural complications or device embolization. Large defects (up to 31 mm, or larger), defects with a very deficient or absent rim, defects with an aneurysmal septum as well as some multiple defects can be closed with an almost 100% early complete occlusion rate. The excellent effectiveness and safety make the transcatheter closure of secundum atrial septal defects with the septal occluder an alternative to surgery for selected patients. For optimal selection of patients and device deployment, however, transesophageal echocardiography has become an essential and integral part of the closure procedure. The recent introduction and approval of a 10F, 5.5- to 10-MHz ultrasound-tipped catheter with a vector phased array transducer encouraged us to test the feasibility of catheter closure of atrial septal defect and patent foramen ovale under intracardiac echocardiography guidance.

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ORIGINAL ARTICLE

Congenital Lobar Emphysema: A Clinicopathological Evaluation of 5 Cases

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Abstract:

Congenital lobar emphysema (CLE) is a rare neonatal respiratory tract pathology characterized by over inflation of a pulmonary lobe and may present as a diagnostic and therapeutic dilemma.

Children who had CLE and were treated at our thoracic surgical unit in 2007 were analyzed prospectively. Five children had CLE. They were evaluated including age, sex, clinical picture, localization, diagnostic and surgical modalities and histopathological diagnosis. Major presenting symptoms were dyspnea, cyanosis and recurrent respiratory tract infection. Chest x-rays and computerized tomography scans showed hyperinflation of the affected lobes compressing the adjacent lobe with mediastinal shifting.

In all patients only one lobe was affected. The affected left upper lobe was surgically removed in all cases and postoperative course was uneventful. No mortality was encountered in the series.

Surgical excision of the affected lobe is the appropriate treatment in all children with severe respiratory symptoms.

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Introduction:

Congenital lobar emphysema (CLE) is one of the unusual childhood respiratory pathologies that may cause an emergency clinical picture resulting in diagnostic and therapeutic dilemma[1]. Etiologic mechanisms proposed for CLE include an unusual flaccidity of the bronchial walls caused by the abnormality or malformation of the bronchial cartilage, redundant bronchial mucosal folds and webs, or compression of the bronchus by an abnormal vessel[2]. Associated anomalies are uncommon, but pulmonary and cardiovascular anomalies such as patent ductus arteriosus, ventricular septal defect (VSD), and tetralogy of Fallot with absent pulmonary valve that predispose to compression of the tracheobronchial tree by dilated pulmonary arteries have been described[3]. Clinical presentation varies from acute neonatal respiratory failure to recurrent episodes of tachypnea or infections[4]. CLE is usually considered to be a surgical disease, with lobectomy generally offered as the treatment of choice for all symptomatic children[5]. We have reviewed our experience with CLE during the last year and seek to delineate the salient features with particular emphasis to clinical picture, diagnostic methods, treatment modes, and problems related to management.

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Material & Methods:

All Children with CLE admitted to our thoracic surgical unit in 2007 were reviewed. Patients' records were evaluated with regard to age, sex, perinatal history, clinical picture, diagnostic interventions, associated diseases, treatment methods, pathological findings and outcome. Among the patients (age range, 3 month to 3.5 year) 2 were male and rest were female. All of the patients underwent thoracic CT examination in addition to chest x-ray. Severe respiratory distress and/or repeated attack of pneumonitis were considered as surgical indication. The youngest 2 patients underwent emergency thoracotomy. In all patients, the affected left upper lobes were sent for histopathology after excision.

Result:

In 2007, seven children were admitted into our unit with the diagnosis of CLE. CT scan showed that two of them had pneumothorax and excluded from the study. Data about age, sex, clinical feature, diagnostic methods and treatment are summarized in Table 1.Perinatal history was unremarkable; all of them are full term babies. At least one antenatal ultrasonography was done during last trimester of pregnancy period and none of those commented on respiratory system.

Most of the patients except one presented at birth with presenting symptom dyspnea. All had history of hospital admission more than once before referring to NIDCH. Diagnostic dilemma was evident in discharge certificates of previous admissions. Contained fluid in the emphysematous lobe was misinterpreted as consolidation in chest x-ray.

A chest roentgenogram revealed emphysema of the left upper lobe with herniation across the midline leading to the mediastinal shift, and compression of the remaining left and right pulmonary lobes (Fig 1). Computerized tomography

Table-I

No.	Age/Sex	Duration of symptoms	Presenting Symptoms	DIAG. METHOD	LOCATION	Treatment	Other anomalis
1	6MF	Since birth	Dyspnea	CXR,CT	LUL	Lobectomy	
2	3.5YM	2 Y	Rresp INF	CXR,CT	LUL	Lobectomy	
3	1YM	Since birth	Dyspnea	CXR,CT	LUL	Lobectomy	
4	3MF	Since birth	Dyspnea, cyanosis	CXR,CT	LUL	Lobectomy	ASD
5	1.5YF	Since birth	Dyspnea	CXR,CT	LUL	Lobectomy	VSD

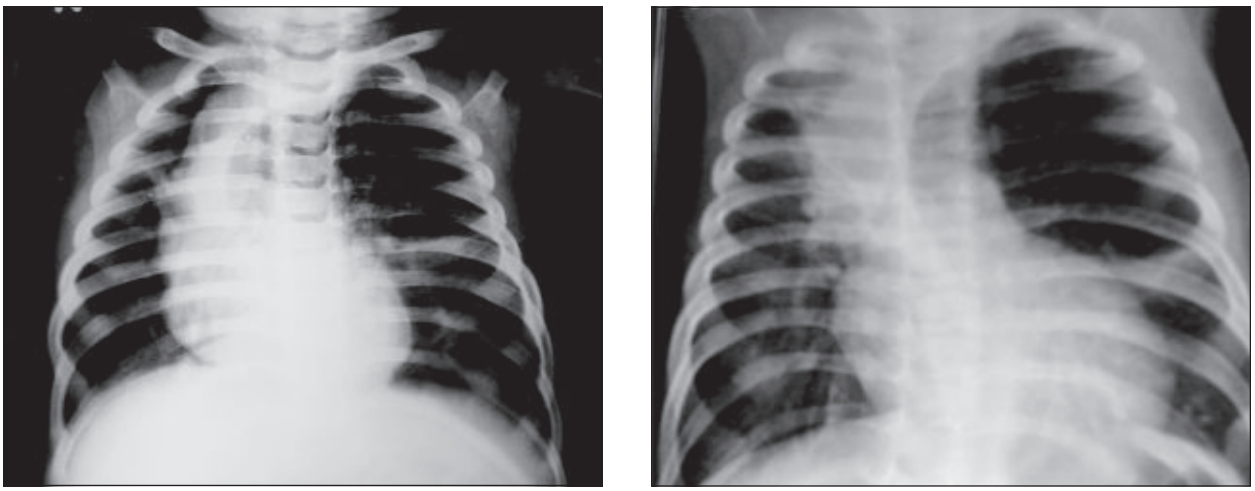

Fig.-1: *X-rays show CLE of left upper lobe.*

(CT) of the chest was performed in all patients and showed hyperaeration atelectasis in 5, consolidation in 2.Ventilation- perfusion scan could not be performed due to lack of technical support in the country.

Bronchoscopy was performed in 2 older patients to exclude foreign body inhalation as assumptive history was given by parents and found normal in 1. Serous secretion was aspirated from other.

All patients underwent echocardiography to exclude cardiac anomalies and were found in 2 patients. Cardiologists' consultations were obtained for them.

In all patients left upper lobe was involved.

The affected lobe was surgically excised via a posterolateral thoracotomy. In the 2 youngest patients, emergency thoracotomy was performed.

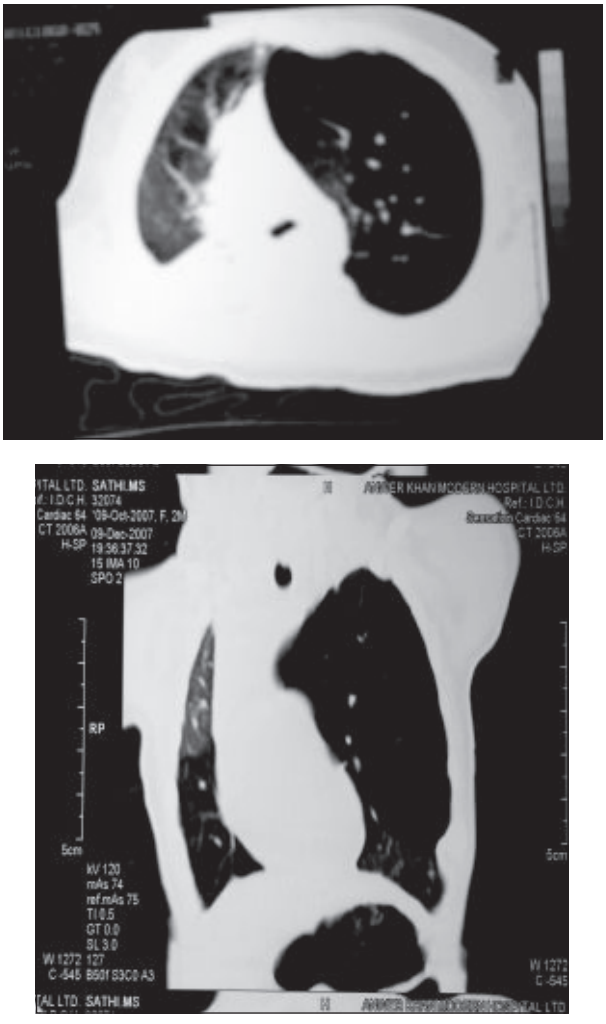

Fig.-2: *CT scan show CLE of left upper lobe.*

All of the patients improved dramatically with relief of respiratory distress, cough and cyanosis in postoperative period. Postoperative course is uneventful in all patients except one who suffered from respiratory infection. No patient required pre- or post-operative ventilation. No mortality was encountered.

Histopathological examination of the resected specimens showed diffuse emphysematous change with mild interstitial fibrosis and infiltration of chronic inflammatory cells.

All patients are still in follow up. The longest one is one year. One of the patients suffers from wheeze.

Discussion:

CLE is a rare congenital anomaly, with a prevalence of approximately 1in 20,000 to 30,000 live births [6, 7] characterized by the over inflation of a pulmonary lobe[8]. In 50% of the cases, a clear etiology cannot be identified[9]. Rest of the cases are attributed to a congenital cartilage defect, bronchial obstruction caused by abnormal mucosal folds, bronchial stenosis or kinking, by definition is not acquired by aspiration of a foreign body or mucus plugging[5,9,10,11]. Rare causes include anomalous cardiopulmonary vasculature, poly alveolar lobe and intrathoracic mass[9,12]. Chapdelaine et al reported cases of congenital pulmonary lymphangiectasis that presented as CLE[16].

CLE is more common among boys than girls. It usually is unilateral, affecting the left upper lobe, followed by the right middle lobe and right upper lobe, although bilateral involvement has been reported[1,5,11,13,14,15]. TØrkan Tansel Elmacý & his colleagues showed that it is more common in girls[4] and right lung is more common in some series[4]. In our series, among the patients 3 were female and 2 were male. All of them had emphysematous left upper lobe.

Perinatal histories showed most of the patients were term babies[1]. Antenatal ultrasound helped in diagnosis and in follow-up during pregnancy period. The end result was from complete regression to diseased state[5,11]. Though all the patients of our series were term babies, no comment on respiratory system were obtained on ultrsonogram performed during pregnancy period.

CLE causes a varying degree of respiratory distress, but the patient may remain asymptomatic. Signs at presentation include respiratory distress, intercostal indrawing, nasal flaring, cyanosis and decreased breath sounds on auscultation with hyper resonance. Tracheal deviation may be present. Severe life threatening respiratory distress is the least common form of presentation that requires emergency thoracotomy[1,4]. The diagnosis is sometimes difficult and should be distinguished from other causes of respiratory distress particularly pneumothorax[15]. This was also evident in our series and patients were referred to NIDCH after being admitted into hospitals at least more than once. It is diagnosed within the first 6 months of life in 80% to 95% of cases with symptoms appearing within the first month in 50% to 60%[1,6,16].

Chest x-ray is the initial investigation in all cases followed by CT scan of chest in almost all cases[1,4, 11]. Chest x-rays show a large space occupying emphysematous lobe with indistinct lung and vessel markings within and ipsilateral atelectatic lung tissue in the apical or supradiaphragmatic regions. There is also widening of the rib spaces, flattening of the ipsilateral diaphragm, and a mediastinal shift to the contralateral side. In cases in which the emphysematous lobe is large, lung herniation to the contralateral hemithorax and atelectasis of the contralateral lung can be seen[1,3,11]. The radiological differential diagnosis includes pneumothorax, pneumatocele, atelectasis, or hypoplasia of the lung with hyperinflation of the contralateral lung, diaphragmatic hernia, and congenital cystic adenomatoid malformation[17]. It is very important not to confuse CLE with a pneumothorax; an intercostal tube further increases respiratory distress[6,11,13,16].

A perfusion scan can show decreased perfusion secondary to the compression of the surrounding blood vessels, and a ventilation scan may show reduced ventilation of the affected lobe[1,15].

The place of bronchoscopy in the diagnosis of CLE is controversial. Improper use of this procedure may aggravate the respiratory distress in CLE patients[13]. Bronchoscopy should be used to exclude foreign body aspiration in suspected cases and in older children, to exclude endobronchial masses, before assigning a diagnosis of CLE to these patients. Additionally, it should be used in all patients who are candidates for conservative treatment[1,11,16].

Congenital heart disease is found in about 20% of the patients with CLE.

Cardiac anomalies include ventricular septal defect, patent ductus arteriosus, interruption of the aortic arch, and tetralogy of Fallot with absent pulmonary valve. The optimal treatment for concomitant congenital heart disease and CLE is not clear. Surgical alternatives include correcting the cardiac defect alone, resection of the affected lobe, or correcting the both lesions simultaneously [3].

Lobectomy is the universally accepted treatment mode of CLE with severe symptoms[1,4,11,15,18, 19]. In neonates and infants with severe respiratory distress, emergency thoracotomy may be life saving. Excision of the affected lobe by video-assisted thoracic surgery is increasing in number[19,20]. The prognosis after lobectomy for patients with CLE diagnosed in early infancy is generally good and reflects, in part, the potential for compensatory alveolar development up to 2 years of age[1,4]. Conservative and surgical treatments have similar outcome after long-term follow up in those children who present with mild to moderate symptoms. These findings support the recommendation for non-operative management in children[1,5]. In these cases close follow-up is mandatory, and at any time surgery may be needed for severe symptom.

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ORIGINAL ARTICLE

Activities of a Paediatric Cardiac Catheterization Laboratory in a Tertiary Hospital: One Year Experience

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Abstract:

***Aim**: Aim of this study was to analyze the activities of paediatric cardiac catheterization laboratory of Combined Military Hospital (CMH) Dhaka.*

***Methods**: It is a retrospective study. Study period extends from January 2006 to December 2006. Data's were collected from register maintained in the catheterization laboratory and in the post -catheterization observation room.*

***Variables**: Type of procedures performed in children in catheterization laboratory, type of cardiac catheterization, age & sex distribution of patients, pattern of diseases among children, pattern of interventions performed & post operative complications after catheterization.*

***Results**: out of 531 admitted patients in paediatric cardiology unit, cardiac catheterization was performed in 246 (46.33%) cases, pericardiocentesis in 10(1.88%) cases, peripheral angiography in 6(1.13%) cases & central venous line was placed under fluoroscopy guide in 20(3.75 %) cases.*

Diagnostic cardiac catheterization was performed in 177(71.95%)cases & Therapeutic catherization /intervention was performed in 69(28.05%)cases .Among 246 cardiac catheterization cases, 135 (54.88%) were male & 111(45.12%) were female. Most of the patients (99 patients) were in 6 months to 3 years age group & least in (29 patients) 0-6 months age group.

Total therapeutic catheterization was performed in 69 cases out of which 42.03% were PDA device closure, 21.75 % were pulmonary valvoplasty, 13.04% were ASD closure, 8.68% were life saving atrial septostomy & 7.25% were VSD device closures. Maximum (17.89%) patients had ventricular septal defects (VSD) of various types.

Complications like embolization of VSD device was observed in one case, cyanotic spell was encountered in two cases of Tetralogy of Fallot (TOF), loss of femoral pulse was noticed in 05 cases & one patient expired from aspiration of milk 6 hours after successful aortic balloon valvoplasty.

***Conclusion**: Paediatric cardiac catheterization is a difficult procedure. Patient needs preoperative, Operative & Post operative assessment & management to avoid complications. Team work is mandatory among all staffs to have successful out come.*

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Introduction:

In recent years the capabilities of cardiac catheterization in children have increased enormously. Many form of heart diseases that previously required operative management are now corrected with trans-catheter techniques.

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Because of its capability for showing excellent anatomic defect and the possibility for repeated examinations, echo-cardiography has largely supplanted angiography as the prime source for examining cardiac anatomy. But angiography is still needed when there are poor echocardiographic windows and when some kind of intervention is required. In the past few years, catheterization has become safe & more precise. New smaller catheters, flexible shafts, flow directed balloons, less toxic contrast agents, improved anatomical understanding provided by the pre-catheterization echo-cardiography & imaging systems with superior resolution & less radiation have all contributed to this improved safety [1-3].

Given the enormous variability of congenital heart disease, skill at echocardiographic diagnosis, surgical approaches & experiences at interventional techniques, a listing of the indication for cardiac catheterization that would apply to each cardiac institution simply is not possible.

For our institution we select only those cases for catheterization who needs pre surgical evaluation like pulmonary vascular resistance calculation, feasibility study for Fontan operation etc.

In some complex cases we also perform angiography for further clarification of anatomy. Other then these, we perform catheterization for therapeutic purpose.

This study analyzed 246 cases of heart diseases in children who had undergone cardiac catheterization in catheterization laboratory of combined military hospital (CMH) Dhaka in the year 2006 .Diagnostic catheterization was performed in 177 cases & therapeutic catheterization in 69 cases. Diagnostic cases were referred to cardiac surgeon in majority of cases and therapeutic cases were discharged with follow-up plan for two years .No significant complications were observed in catheterization laboratory or in the post-Cath room. Only one patient expired possibly from aspiration of breast milk in post-Cath room after 6 hours of a successful aortic valvoplasty .

This study has shown the patterns of diseases among children who had undergone cardiac catheterization either for the diagnostic or for the therapeutic purpose. This study represents whole country scenario as patients are referred to this centre from all other cardiac centers of the country, because full range catheterization facility for children is not available in other centers of the country.

Materials & Methods:

This is a retrospective study carried out in the paediatric catheterization laboratory of CMH Dhaka. Two hundred & forty six patients had undergone cardiac catheterization from January 2006 to December 2006.Other than cardiac catheterization, peripheral angiography & pericardiocentesis were performed in 6 & 10 cases respectively. Venous line was given under fluoroscopy guide in 20 children.

All the patients who had undergone cardiac catheterization were included in the study, Selection criteria for cardiac catheterization were: **1**. Therapeutic purpose like closure of atrial or ventricular septal defects, closure of ductus arteriosus, balloon dilatation of valves or vessels, stenting of vessels, atrial septostomy etc **2**. Diagnostic purpose like calculation of shunt, calculation of peripheral vascular resistance, feasibility study for Fontan operation, for further identification of anatomical structure in complex congenital lesions.

Data's were collected from the register maintained in the catheterization laboratory manually. Some additional data's were collected from Post catheterization observation room to include complications in immediate (24 hours) post operative period. Disease pattern of patients were identified & diagnostic / therapeutic catheterization were recorded under separate headings.

Results:

Table l showed percentage of various procedures among admitted patient. Total admission was five hundred thirty one (100%). Cardiac catheterization was performed in 246(46.33%) cases. Pericardiocentesis for significant pericardial effusion was performed in 10(1.88%) cases. Peripheral angioplasty was performed in 6 (1.13%) cases to look for carotids, renal or femoral arteries for various reasons. Central venous line was given in 20(3.75%) cases in catheterization laboratory as they were newborn or infant and fluoroscopy guide was required.

Table I

Percentage of various procedures amongst admitted patient Jan-Dec 2006
N=531

Procedure	No.	Percentage
Total Admission	531	100%
Total cardiac catheterization	246	46.33%
Pericardiocentesis	10	1.88%
Peripheral angiography	06	1.13%
Central Venous line in infants	20	3.75

Table-II showed percentage of diagnostic and interventional catheterization amongst patients who had cardiac catheterization. One hundred and seventy seven(71.95%) patient had catheterization for diagnostic purpose and to measure pulmonary vascular resistance .Some of them were for trial of device closure but later on found unsuitable for such intervention. Sixty nine (28.05%) patient had interventional procedure like various device closures, balloon dilatation of valves and vessels and septostomy.

Table II

Type of cardiac catheterization in catheterization laboratory-CMH Dhaka.
N=246

Procedure	Numbers	Percentage
Diagnostic Cardiac Catheterization	177	71.95%
Interventional Catheterization	69	28.05%

Table-III showed sex ratio amongst patient who had undergone cardiac catheterization. One hundred thirty five (54.88%) patients were male and 111(45.12%) were female.

Table III

Sex distribution of patients who had undergone Cardiac Catheterization
N=246

Sex	No	%
Male	135	54.88%
Female	111	45.12%

Table-IV showed age distributions of patients. Twenty nine patients were in 0-6 months age group. Ninety patients were in >six months to 3 years age group. Seventy eight patients were in >three years to 10 years age group and forty patients were in >ten years age group .Most(76.76%) of the patient were in >six months to 3 years age group and device closure was common in this age group. Life saving interventions were performed mainly in age group A (0-6months).

Table IV

Age distribution of patients with percentage of diagnostic and interventional procedure in each group

Age group	Total number	Diagnostic	Intervention
0-6month	29	10(34.48)	19(65.52)
6 month -3 years	99	76(76.76%)	23(23.24%)
>3yrs-10yrs	78	61(78.20%)	17(21.24%)
>10yrs	40	30(75%)	10(25%)

Table-V showed name of various interventions performed and there percentage. PDA device /coil occlusion was performed in maximum (42.03%) cases. Next common was pulmonary valvoplasty which was performed in 21.75% of cases.

Table-V

Interventions in Cath lab CMH Dhaka
N=69

Types of procedure	No	%
ASD device closure	9	13.04
VSD device closure	5	7.25
PDA device/coil closure	29	42.03
Life saving septostomy	06	8.68
Pulmonary valvoplasty	15	21.75
Coarctation angioplasty	03	4.35
Aortic valvoplasty	01	1.45
PTMC	01	1.45

ASD device closure was third common intervention which was performed in 9(13.01%) cases. Balloon atrial septostomy was the fourth common intervention which was performed in 6(8.68%) cases. VSD device closure was performed in 5(7.25%) cases. Aortic valvoplasty and PTMC was performed in one (1.45%) case.

Table-VI Showed disease pattern of patient who had undergone cardiac catheterization. Twenty one kinds of diseases were encountered amongst which various kind of VSD was commonest (17.89%). Next common were TOF (16.67%), PDA (13%) and ASD secundum (8.13%) etc.

Table VI

Disease pattern of patients who had undergone cardiac catheterization N=246

Disease	No	Percentage
Various types of VSD	44	17.89
ASD Secundum	20	8.13
Sinus venosus ASD and PAPVD	5	2.03
AV canal defect	4	1.62
VSD with PS (infundibular/ Valvular)	17	6.91
VSD and PDA	5	2.03
ASD, VSD and PDA	5	2.03
PDA	3	1.22
Pulmonary valve Stenosis	20	8.13
Coarctation of aorta	5	2.03
Aortic Stenosis and Supra AS	5	2.03
TOF	41	16.67
TGA	8	3.25
Corrected TGA	3	1.22
Tricuspid Atresia	3	1.22
Pulmonary Atresia	8	3.25
Truncus Arteriosus	1	0.04
Single Ventricle	8	3.25
A-P Window	2	0.81
DORV	5	2.03
Aneurysm	2	0.81

VSD= Ventricular Septal Defect. ASD= Atrial Septal Defect. PAPVD=Partial anomalous Pulmonary Venous drainaige. AV canal defect= Atrioventricular septal defect. PDA= Patent ductus Arteriosus. TOF= Tetralogy of Fallot. TGA= Transposition of great arteries. DORV= Double outlet right ventricule.

TableVII Showed complications of cardiac catheterizations and interventions. Most common was loss of femoral pulse which was noticed in five cases .Cyanotic spell was experienced in 2 cases of TOF after procedure. Embolization of PDA coil was experienced in 2 cases which were later retrieved and device was deployed. One patient expired in post Cath room after 6 hours of Aortic valvoplasty from aspiration of milk.

Table VII

Complications of procedure N=246

Name of complication	No	Treatment given	Result
Loss of Femoral pulse	06(2%)	Heparin infusion	Good
Emobilization of VSD Device	01(>4%)	Retrieval with snare catheter	Good, surgery advised later on
Emobilization of PDA Device	NIl	-	-
Emobilization of PDA Coil	02(0.8%)	Retrieval with snare catheter	Good, PDA closed with Device Later on
Emobilization of ASD Device	NIL	-	-
Cyanotic Spell in TOF patient	02(0.8%)	Inj.Esmolol, sodibicarb, morphine	Refd. to cardiac surgeon for BT shunt
Death in Cath lab	Nil	-	-
Death in post-cath room	01(0.4%) (aspiration of milk)	CPR	

Discussion:

Stephen Hales measurement of arterial pressure[4],warner Forssman's celebrated autocannulation[5] and Andrew cournand's assessment of pulmonary arterial pressure in human disease[6] mark the known beginnings of earlier catheterization.

The first cardiac catheterization in case of congenital heart disease was reported in 1946[7].

Therapeutic catheterization procedure remained dormant until the development of the life saving balloon septostomy technique for transposition of great arteries by Rashkind and Miller[8].

The ability to get repeated observations easily in a patient makes the echocardiogram the prime tool of diagnosing congenital heart diseases. Still angiography is needed when there are poor echocardiographic windows and when there is intervening bone or air filled lungs and when a decision to undertake surgery is being debated[2].

One of the main purposes of cardiac catheterization is to allow angiography to be performed, that is the injection of radio-opaque contrast medium into the heart. Its passage is than recorded on cine films, usually with two cameras running simultaneously showing two different views of the heart in two different planes. Contrast media used now a days are less toxic, but can cause

deterioration especially in infants, so the number of injections should be limited. A pump injection is used and can be programmed to deliver the contrast medium at planned volume and speed[9]. Angiography allows visualization of septal defects, recognition of vessels, condition of valves etc.

Haemodynamic study includes measurement of pressure and saturations from different chamber of heart in different conditions. This allow calculation of shunt, vascular resistance, cardiac out put etc.

Theraparetic interventions in our catheterization laboratory is ment for Rashkind balloon atrial septostomy[10] pulmonary valvoplasty and aortic valvoplasty[11,] Coractation angioplasty[12], ASD device closure [13, 14], PDA coil or device closure [15] VSD device closure [16,] Stenting of PDA in ductus dependent lesion of newborn and

stenting of infundibulum in severe infundibular stenosis of newborn, Percutaneous Transluminal Mitral Commisurotomy (PTMC), Removal of foreign body etc.

Ventricular septal defect was the commonest lesion (17.89%) found in this series followed by Tetralogy of Fallot (16.67.1%). Because these two categories of lesion needs angiographic and haemodynamic evaluation before surgery. Closure of patent ductus arteriosus by coil or device was the commonest interventional procedure in our laboratory (42.03%) followed by pulmonary valvoplasty (21.75%).

Embolization of PDA coil was experienced in two cases (0.8%) which were later removed by snare catheter and PDA was closed with device. VSD device was embolized in one case (0.4%).Only one patient expired (0.4%) Six hours after aortic valvoplasty who was a newborn and this sudden death was from aspiration of breast milk which was given by the mother against medical advice. So complications and death in our cath lab is extremely low comparing to other standard pediatric cardiac catheterization laboratory[17]. Incidence of complications in one study was 12% in infant less than 4 months compared with 1.5% in the older infants[18,19]. Mortality in Boston children hospital within 48 hours of catheterization was 1.7%.

Conclusion:

Cardiac catheterization, either diagnostic or interventional is always challenging in children. Newborn and infants need special attention in pre-operative and postoperative period. A trained team of pediatric cardiologist, nurses and technicians should take part in such procedure. A person who is the leader of the team should know the consequence of whole procedure and he should be ready with every equipments to face complications if it arises from procedure at any time. One should remembers that heart is not an organ to play with and complications like perforation of heart almost always has serious outcome in children.

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REVIEW ARTICLE

Lung Cancer-An Overview

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Epidemiology

During the twentieth century lung cancer has emerged as the most common form of malignant diseases. Regarding burden of lung cancer 36000 patient deaths/year in the UK[1]. Around 40000 new patients are now seen each year, Accounting for more than 8% of all male and 4% of all female deaths and 25% of all cancer deaths. More than three fold increase in deaths since 1960. more rapidly increasing cause of cancer death in female, most common cause of cancer death in male. After breast cancer, 2nd most common cause of cancer death in female[2] .

Aetiology

- Tobacco smoking
- Atmospheric pollution
- Occupation
- Pulmonary scarring

Tobacco smoking

It has been known for many years that the smoking of tobacco cigarettes by for the most common cause for lung cancer. It was estimated that cigarette smoking are 8-20 times more likely to develop Lung cancer than lifelong nonsmoker and the extent of this risk correlated closely in the number of cigarettes smoked[3] . There is some evidence to suggest that the risk of lung cancer may be reduced by the use of filter tips and by lower tar yield. Following cessation of smoking the risk of developing lung cancer has been shown to decline progressively with time. However even by 10-20 years, the risk is still about 2-5 times. Unfortunately, smokers do not only increase their own risk of developing lung cancer since there is evidence that the inhalation of other peoples tobacco smoke (Passive Smoking) on a long term basis is linked with an increased incidence of the disease.

Atmospheric pollution

The role of environment air pollution is the production by lung is controversial and has certainly been for less important than the part played by cigarette smoking[4]. Urban dwellers have a risk of lung cancer that is 1.26-2.33 times greater than people living in the country side. Is is known that underground miners exposed to high levels of the radon pogency that decay from uranium have a increase risk of lung cancer.

Occupational factor

cause	Occupation
Asbestos	Mining
Radio activity	Uranium
Nickel	Refining

Pulmonary scarring

The pathogenesis of small numbers of scar cancer is not established and many causes the subjects tobacco smoking history may be highly relevant [s]. This is particularly with asbestos exposure. cryptogenic fibrosing alveolitis is also associated with cancer of lung. The incidence of lung cancer is high in a case of sarcoidosis and cystic fibrosis.

Classification of Lung Cancer According to WHO

squamous cell carcinoma (Epidarmoid carcinoma)
Small cell carcinoma

- oat cell carcinoma
- Intermediate cell carcinoma Adeno carcinoma
- Acinar cell carcinoma
- Papillary adeno carcinoma - Bronchoalveolar carcinoma

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- Large cell carcinoma
- Giant cell carcinoma - Clear cell carcinoma
- adeno squamous carcinoma
- carcinoid tumour
- Bronchial gland carcinoma

Clinician recognized 4(four) major group

- Squamous cell carcinoma 35%
- Adeno carcinoma 30%
- Small cell carcinoma 20%
- Large cell carcinoma 15%

Squamous cell carcinoma

This is the most common type of lungs cancer. majority are centrally situated. Those that are more differentiated grow more slowly and less likely to give rise to extra thoracic metastases[6]. Those squamous cell carcinoma that are more poorly differentiated tends to behave aggressively extra thoracic metastases. It is not uncommon that this type of cancer cavitates.

Adeno carcinoma

It is type of lung of cancer less likely related to smoking. It is usually peripheral tumour and exfoliation is common in sputum and pleural fluid.

Small cell cancer

It is centrally located tumour. It is rapidly growing and metastasize early and widely so that disease is rarely limited to the chest at diagnosis[7] . The organ where spread are liver, bone, CNS, LN, adrenal and other abdominal organ.

Large cell carcinoma

Majority of this type of tumour are at lung periphery.

Clinical presentation

Majority of patients present as the result of the investigation of some new respiratory symptoms [8]. A small percentage have no respiratory symptom and the diagnosis in made by the chance finding of an opacity on a chest radiography ordered for some other reason. A third group developed nonspecific symptoms of malignancy including, weight loss, anorexia, malaise etc. A fourth group presents as a result of metastatic disease and usually have an extremely poor prognosis.

Investigation

The purpose of any investigations performed are to confirm the clinical diagnosis including its histological type and also to assess the extent or stage of diseases in order to plan the most appropriate management[9].

Fig.-1:outline of the investigation and management of patients with lung cancer.

Chest radiography

Common radiological presentation of lung cancer are

- Unilateral hilar enlargement
- peripheral pulmonary opacity
- Lung, lobe or segmental collapse
- Pleural effusion
- Broadening of Mediastinum
- Elevation of hemidiaphragm
- Rib destruction

Sputum cytology

60-70% of lung cancer can be diagnosed by sputum cytology[10]. The collection of adequate samples extremely important. Morning sample or post bronchoscopy tends to positivity a high.

Bronchoscopy

Bronchoscopy is the most useful investigation in the evaluation of a patient suspected of harbouring a lung cancer. Diagnosis as well as stage of operability can be made.

Other initial investigation

The lesion situated at the periphery can be diagnosed by FNAC.

Some routine blood test have supporting value as well as presence of hepatic involvement and pareneoplastic symdrone.

Determination of operability

Once a diagnosis is made. The investigation of a patient with lung cancer is aimed at deciding the most appropriate therapy available for the individual. The forced vital capacity and forced expiratory volume in IS (FEV1) are simple to measure, reproducible and form the basis of the most reliable predictable measurement in the evaluation of suitability for lung resection.

Assessment of local spread

- CT scan of chest.
- Pleural fluid aspiration with Biopsy
- Mediastinoscopy

Assessment of distant spread

Liver metastases assess by liver function Test & CT scan of abdomen with sometimes required CT guided FNAC.

Bone metastases Detected by Bone Scan

Brain Metastases

The investigation of choice is CT Scan of brain

Fig.2: Management of potentially operable patient.

Staging

Patient with non small cell cancer are staged by the application of process using T for primary tumour, N for regional Lymphnode and M for distant metastases. The various TNM classification has been divided into stage I-IV. Stage III split into stage III A which is potentially operable and stage III B is inoperable.

Table- I

Table-I

TNM definitions in the international staging system for lung cancer

Extent of primary tumour (T)

TO No primary tumour detected.

Tis Carcinoma in situ.

TX Primary cannot be assessed/ positive cytology only.

T1 A tumour 3cm in size, or less in greatest dimension, surrounded by lung or visceral pleura, not in main bronchus.

T2 A tumour more than 3cm in size, or in main bronchus more than 2cm from main carina, or invading visceral pleura, or associated with partial atelectasis (not entire lung).

T3 Involves any of following: chest wall (including superior sulcus), diaphragm, parietal pericardium, mediastinal pleura. In main bronchus less than 2cm from main carina (but not involving it), atelectasses of entire ling.)

T4 Invasion of mediastinum, heart/great vessels, traches, carind, oesophagus, vertebral body. Separate nodules in same lobe as primary, malignant pleural or pericardial effusion.

Condition of regional lymph nodes (N)

NX Regional lymph nodes cannot be assessed

NO No regional lymph node metastases.

N1 Ipsilateral peribronchial or hillar nodes involved.

N2 Ipsilateral mediastinal or subcarinal nodes involved.

N3 Contralateral hilar or mediastinal nodes involved, or any scalene/supraclavicular nodes involved.

Presence of absence of distant metastases (M)

MX Distant metastases cannot be assessed

MO No distant metastases.

M1 Distant metastases, includes separate nodule in different lobe.

Stage groupings (S year survival rates in parentheses)

Stage 0	Tis	NO	MO	(?)
Stage IA	TI	NO	MO	(60%)
Stage IB	T2	NO	MO	(38%)
Stage IIA	T 1	N 1	MO	(34%)
Stage IIB	T2	N 1	MO	(24%)
T3	NO	MO	(22%)	
Stage IIIA	TI	N2	MO	(13%)
T2	N2	MO	(13%)	
T3	N I-2	MO	(9%)	
Stage IIIB	T4	NO-2	MO	(7%)
T1-4	N3	MO	(3%)	
Stage I V	Any T	Any N	M 1	(1 %)

Management

Modalities of treatment are:

1. Surgery
2. Chemotherapy
3. Radiotherapy

Determination of operability

Once a diagnosis is made, the investigation of a patient with lung cancer is aimed at deciding the most appropriate therapy available for that individual. Surgical resection has the greatest

impact on survival although at the time of diagnosis the majority of the patients is clearly inoperable. If the patient is a prospective surgical candidate further evaluation has to be carried in order to ensure that he or she is fit for an operation.

Assessment of fitness for surgery

It is common for the lung function of patients with carcinoma of bronchus to be impaired as a result of total or partial occlusion of large bronchus by a central lesion and because of coexisting COPD. Careful consideration must be given to the effect of the removal of functional lung tissue in the tumour bearing lung in order to prevent at worst, post operative respiratory failure and even death or at best, extreme and persistent dyspnoea that would greatly impair the patients level of physical activity and quality of life. The forced expiratory volume in one second (FEV i) and forced vital capacity are simple to measure, reproducible and form the basis of the most reliable predictable measurement in the evaluation of suitability for lung resection. Studies have shown that the risk of post operative chronic ventilatory failure is high if the post operative FEV, is less than IL. Spirometry is reduced by approximately 10-15% of predicated value as a result of lobactory and by 20-30% with pneumonectomy. In general patients with a pre operative FEV, exceeding 2L tolerate surgery without severe post operative breathlessness. Other useful tests that can be perform pre operatively include the measurement by diffusing capasity. Since it is known that post operative complication are more common if this is less than 40% predicated value. Now a days, a 6 minutes waking test give a good indication of preoperative function and difficulty completing this test at a reasonable pace should cause one to think twice advice to surger. Consideration also needs to be given to other medical conditions such as ischaemic heart diseases and peripheral vascular diseases.

Treatment

When discussing the current treatments available for patients with lung cancer, it relevant to divided the subjects into the management of non small cell and small cell types. The majority of patients have non-small cell tumour and the treatment modalities that gives the best result is still surgery. However, most patients are inoperable and palliation is the aim of any treatment offered. In this respect radiotherapy is very helpful. Indeed, some patients who are not suitable for surgery may be treated with radical radiotherapy. The role of chemotherapy in non small cell lung cancer is controversial but is gaining acceptance in some centre.

Non small cell lung cancer

The prognosis for patients diagnosed with non small cell lung cancer is poor. Most large series of unselected patients giving an overall 5 yeas survival of less than 10% irrespective treatment.

Surgery

Although surgery is effective treatment for bronchial carcinoma. Unfortunately the disease is only operable is a small majority of patients. Upwards of two third of patients are inoperable at the time of presentation because of advanced age, poor respiratory function, other significant medical conditions or evidence of tumour spread of the remainder, who are considered for surgery. 10-15% are rejected because of mediastinal involvement. Approximately 20-25% undergo surgery and up to 5% are found inoperable at thoracotomy. This means that only about 12-15% of all patients with non-small cell tumours have chance of receiving a potentially curable operation.

Radiotherapy

Radiotherapy is commonly used to achieve symptomatic relief when given is a low palliative dose to patients who are clearly inoperable and have appropriate symptoms due to their disease. Radical radiotherapy may offer the chance of cure in a small proportion of patients with non-small cell cancer, who are considered unsuitable for surgery or medical gruonds otherwise have operable diseases.

Radical Radiotherapy

This term implies on intention on the part of the radiotherapy to employ a relatively large dose of treatment is order to increase the patients survival time or even to achieve a cure. Patients with stage I and II non-small cell lung cancer are best treated by surgical resection, however if this form of treatment cannot be followed because of some medical contraindication, then radiotherapy does offer a small chance of cure. Initial results suggested that radical radiotherapy was the more

effective treatment although subsequent studies have not supported this and the place of surgery in treatment is well established. Patients who have stage III B (inoperable) diseases have a much poorer outlook but may benefit from radical radiotherapy provided that their disease is limited to one hemthorax.

In addition to planning the treatment fields, the further important variables that have to be determined are the total dose of radiation, the number of fractions is which it is given and the duration of the course. In general doses of 50-60 Gy over a period of 4-6 weeks are used.

An interesting, recent development is the scheduling of radical radiotherapy has taken into account evidence from cell kinetic studies that tumours may repopulate in the standard interval between treatments. A regiment of continuous hyper fractionated accelerated radiotherapy (CHART) has been developed where treatment in gives three times daily at interval If 6 hours for 12 consecutive days.

Palliative treatment

The majority of patients with non-small cell cancer who have extra thoracic metastases die within 6 months of diagnosis and when radiotherapy is used in these patients its only aim is to relieve distressing symptoms.

Palliative radiotherapy for distressing symptoms Haemoptysis

Pain : bony, chest wall, nerve root Cough

Dyspnoea due to large bronchus obstruction

Mediastinal compression: obstruction of superior venacava Symptoms due to intracranial metastases Symptoms due to spiral cord compression

Endobronchial treatment

Endobronchial treatments have evolved is last two decades to help palliative symptoms such an haemoptysis and critical obstruction of main airways and these are laser therapy, endobronchial radiotherapy and photodynamic therapy.

Chemotherapy

The main limitation to the effectiveness of surgery and radiotherapy in patients with non-small cell cancer is that evidence of metastatic spread at presentation may prevent treatment or that treatment may fail because of recurrent disease commonly occurring at distant site. There is a clear need for systemic treatment for the vast majority of patient and this has inevitably led to trial of cytotoxic drugs. Unfortunately, while chemotherapy is the mainstay of treatment of small cell cancer of the lung. Non small cancer are relatively resistant to the drugs, currently available. Trials comparing chemotherapy with a control group of best supportive care have only recently appeared. Most have shown a modest survival advantage to chemotherapy treatment, although no study has accurately measured quality of life and therefore the effect of treatment on palliation of symptoms is not yet available.

Activity of single agent drugs in non small lung cancer

Drugs	Response rate
Ifosfamide	26%
Cisplatin	21
Mitomycin	20%
Vindesine	18%
Doxorubicine	13%
Etoposide	9%

Combined modalities of treatment

Surgery and radiotherapy

The combination of radiotherapy and surgery was first reported in the earlier 1950s for tumour that were originally believed to be inoperable but which were subsequently resected after initial radiotherapy and tumour shrinkage. But no clear survival advantage has been shown for this scheduling of radiotherapy and surgery, the exception to this is with super sulcus tumour.

The exact effect of post operative radiotherapy on survival has been questioned by a metaanalysis.

Surgery and chemotherapy

In the past chemotherapy was given post operatively(Adjuvant therapy). More recently, encouraging results have been obtained from the use of chemotherapy given before the operation (Neo adjuvant).

Radiotherapy and chemotherapy

The aim of combined chemotherapy and radiotherapy is to optimize local control and to control distant metastases. There was a definite

benefit for combined therapy compared with radiation therapy alone. There is a evidence that platinum based chemotherapy before radiotherapy gives a modest survival advantages.

Small cell cancer

Of all patients with bronchial carcinosm, 25% have small cell tumour. This lesion grow move aggressively and patients usually present with short history and evidence of metastases. Without treatment, the medium survival rate is 6-8weeks.

Chemotherapy

Unlike non small cell caner, small cell cancer have been found to be more sensitive to chemotherapy and this is now the accepted modality of treatment for most patients with this disease. Not surprisingly, when agents are added together and given as combination treatments, the results are more encouraging in the last two decades. Combination chemotherapy has improved the prognosis significantly. The median survival time in patients with limited diseases is near 14-16 months and with extensive disease 8-10 months.

Radiotherapy

As with chemotherapy, small cell tumour are is general more radiosensitive than non small cancer. However, the precise role for radiotherapy is small cell tumour remains undefined, it may fulfill a useful palliative role in the treatment of distressing symptoms such as haemoptysis, localized pain, intractable cough, CNS metastases, bone secondaries and SVC obstruction.

Surgery

This modalities of treatment usually lost to apply at the time of presentation with the exception of few case.

Paraneoplastic syndromes

This terms "paraneoplastic syndromes" encompasses a variety of non-me,tastatic metabolic or neuro mascular manifestation of lung cancer.

Endocrine

- Inappropriate Antidiuretic hormone (ADH) secretion causing hyponertraemia
- Ectopic adrenocorticotropic hormone (ACTH) secretion
- Hypercalcaemia due to secretion of parathyroid hormone (PTH) related peptides.
- Carcinoid syndrome
- Gynaecomastia

Neurological

- Polyneuropathy, Myelopathy, cerebeller degenaration
- Myasthenia syndrome (Lambart-Eton)

Others

- Digital Clubbing, Polymyositis and dermatomyositis
- Hypertrophic pulmonary osteoarthropathy, eosinophillia
- Nephrotic syndrome

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Chest & Heart Journal
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ORIGINAL ARTICLE

Primary Breast Carcinoma with Tuberculous Axillary Lymph node: Breast Clinic, BSMMU

Saif Uddin Ahmed[1], Naimul Haque[2], Md.Abu Taher[3], Moniruzzaman Ahmed[4]

[Chest & Heart Journal 2008; 32(2) : 97-99]

Introduction:

Co-existence of breast cancer and tuberculosis lymph node in axilla is rare1,2. Tuberculosis and Breast Cancer are common disease in developing countries. It can lead to overstaying of the breast cancer[3]. This can create a dilema in the diagnosis & treatment as there are no pathogrornic symptoms or signs to distinguish both diseases[3.4.5]. FNAC from breast and axillary Lymphnode revealed infiltrating duct cell carcinoma in breast but in axillary Lymphnode co-existence of duct cell carcinoma and granulomatous lesion. Histopathological report shows tuberculosis of axillary Lymphnode. Treatment compliance may also be difficult when two major illness exists.

Materials & Methods:

From 2000 to 2007 a total of 62 patients found tuberculosis of breast and 433 patients found Breast Cancer, 11031 found benign breast disease. Among carcinoma breast, only 3 patients found Breast cancer with tuberculosis lyrnph node in axilla co-exist, at breast clinic, BSMMU, Dhaka.

Results:

There are 3 patients average age is 47 years. All the patients had complaints Rt. breast lump average size is 1.5 cm. and one patient complaints anorexia and occassional evening rise of temperature. On examination axillary lymph node hard in consistency in one patient and others are firm. None of the patient had history of pulmonary tuberculosis but one patient in associated with Insulin dependent diabetes mellitus from last 12 yrs.

FNAC in breast lump 2 patients suggested infiltrating duct cell carcinoma but one patient no conclusive comment. In FNAC from axillary lymph node, 2 patients had non specific lymphadenitis but in suspicious breast lump patient revealed caseous necrosis with epithelloid cell compatible with tuberculosis.

In mamography speculated mass found in two patients CXR showed clustered calcification axillary in 2 patient and one patient showed calcified shadow in Rt. lung. All the patient remarkably raised ESR.

Simple mastectomy and axillary clearance done in two cases, in another patient had excision of breast lump and excision of axillary lymph node. After histopathological report, subsequently after 1 week simple mastectomy and axillary clearance done. In histopathological reprot revealed all the breast lesions are infiltrating duct cell carcinoma and Lymph nodes in axilla of all the patients showed multiple epithelloid granulomas. Post operatively patients received four drugs anti tubercular treatment and six cycles of adjuvant chemotherapy with cyclophosphamide, methotraxate and 5-flurouracil (CMF) given. All patients are disease free after eight months of follow up.

Pt. No.	Age	ATIOLOGICAL FACTOR	CHIEF COMPLASINTS	Diagnosis	H/O Systemic disease	FNAC	Mamography	CXR	ESR	Treatment	Histopathology	Subsequent treatment	Followup after 5 months
1	35	No	Breast Lump with axillary swelling	Ca-Breast	No	LN-Lymph adenitis Breast Lump Duct Duct cell ca	Spiculated mass	Axilla-clusted calcification - NAD	raised	Simple mastectomy Axillary clearance	Duct cell ca LN anuloma	Anti T.B CT	Disease free
2	46	No	Breast Lump with axillary swelling	Ca-Breast		LN-Lymph adenitis Br. Lump Duct cell ca	Spiculated	Lung-NAD axilla NAD	raised	I Simple mastectomy , Axillary clearance	Duct cell ca LN jranuloma	Anti T.B CT	Disease free
3	60	No	Breast Lump with with axillary SWELLING Anorexi and fever	Ca-Breast	DM	LN-TB Breast lump suspicious	NAD	Lung-shadow axilla-clustered calcified	raised t	Excision ~ Lump & LN	Duct cell ca LN granuloma	Anti T.B CT	Disease free

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Discussion:

Tuberculosis and Breast cancer are common disease in developing countries[3]. Their co-existance in the breast and axillary Lymph node is rare[2] and was first reported by pilliet and pialot in 1897 [3,4,6] The association of tuberculosis and cancer has been recorded in most of the organs and has been described and explained by many authors in many diverse ways. Kaplan et al. (1974) reviewed 58245 patients with cancer and identified 201 cases of co-existing tuberculosis'. Highest prevalence was seen in patients with Hodgkins disease (96/10000 cases) followed by lung cancer (92/10000), Lymphosarcoma (88/10000) and reticular cell sarcoma (78/10000)'. Among 14742 cases or breast reviewed by them, only 28 had co-existing tuberculosis in breast, prevalence of 19/ 10000. No cases of axillary nodal co-existence was identified in their series'. The co-existance of breast cancer and tuberculosis has been described in over 100 cases[8,9], however its co-existance in the axillary Lymph node is rare. Only seven cases have been reported in the literature so far,[12] Majority of these cases reported breast cancer with axillary LN showing tubercular foci, while our majority patients had same results.

The clinical situations that arise are the presence of carcinoma at tuberculous mastitis, carcinoma in the breast with axillary tuberculous lymphadentis or both[3]. There is no link between mammary tuberculosis and breast cancer and no evidence that TB is carcinogenic at any site[13]. Co-existence of T.B and cancer can lead to many problems regarding diagnosis and treatment [3,4,5] and may lead to overstaging of breast cancer, these patients lose the opportunity for breast conservative surgery.[3]

Breast clinic, BSMMU, Dhaka, from 2000 to 2007 out of 11464 patient, 433 patient found Breast Cancer and only 3 patient had breast cancer along with Tubercular Lymph node in axilla in last 2 yrs. We were over staging the disease and prepare the patient two patients for treated of cancer only. One patient had suspicious breast lump along with tubercular Lympadenopathy in axilla treated as breast TB but after histopathological report showed breast cancer and subsequently after one week diefinitive proper treatment, simple mastectomy axillary clearance done.

The key to proper treatment is biopsy of the lesion[4]. If cancer is clinically operable, mastectomy is indicated followed by post operative anti T.B. chemotherapy and if cancer is incurable, palliative measures combined with antituberculous drugs are indicated[4].

In our study, subsequently anti T.B.4 drugs therapy given 6 month and 6 cycles of adjuvant CT. In follow up after 8 months all the patients are disease free.

Conclusion:

Breast cancer with axillary Lymph node tuberculosis very difficult to diagnosed but X-ray suggested clusters of calcification in axilla. FNAC may give accurate information but not always. Lymph node biopsy and culture in usefull for confirmation of diagnosis. Treatment compliance may also be difficult when two major illness co-exist. Full liason between surgical oncologist, radiologists, pathologists, oncologists is *very* important to plan best management of such conditions. A possibility should always be done in mind especially in patients from endemic areas.

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CASE REPORT

Traumatic Pneumothorax: May be a Major Airway Injury

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Abstract:
Tracheobronchial injuries are uncommon but potentially life threatening. High level of suspicion and surgical repair are the key to their diagnosis and treatment. We present the case of a 13 year old boy with blunt chest trauma presented with pneumothorax and bronchopleural leak without any vascular injury. After endoscopic evaluation, an end-to-end anastomosis of the transected right bronchus was performed. Subsequent clinical and radiological follow-up showed that the bronchus healed well.

[Chest & Heart Journal 2008; 32(2) : 123-125]

Introduction

Traumatic tracheobronchial injuries are rare but potentially lethal injuries[1]. It requires early diagnosis, skillful airway management, and prompt surgical repair[2]. Rupture of the right main bronchus in pediatric age group is exceptional[3]. We report the management and follow-up of a 13-year-old boy who suffered a right bronchial injury following a road traffic accident.

Case Report

A 13-year-old boy sustained trauma to the chest when he was run over by a motor vehicle while playing, with associated lacerated injury in right thigh. He was brought to near by medical college hospital where Chest x-ray showed right sided pneumothorax with pneumomediastinum with complete collapse of the right lung. The first two ribs of right side were fractured [Fig 1]. Right sided tube thoracostomy was performed at the referring hospital on the day of admission. The pneumothorax did not resolve after placement of chest tube and repeat chest x-ray showed collapsed right lung with large pneumothorax. He was transferred to our institution after four days of injury.

Initially we continued conservative treatment. But improvement was not significant both clinically and radiologically. Repeat roentgenogram showed partial expansion of the right lung. There was persistent air leak, even on tidal respiration. However oxygen saturation was maintained above 90% on supplemental 0_2 and nebulization with salbutamol and ipratromium bromide. Rigid bronchoscopy was performed to evaluate the injury. It showed disruption of the right principal bronchus 1 cm distal to carina We planned to perform right thoracotomy and bronchial repair.

On 14" day of injury the patient underwent right posterolateral thoracotomy. Single lung ventilation was achieved by a single lumen endotracheal tube. After opening of the pleura; a complete transaction of the right principal bronchus was noted. The distal stump with detached lung was matted with chest wall in such a manner that identification of distal stump was difficult. The distal stump was found 5 mm proximal to the origin of the right upper lobe bronchus, covered with old clotted blood. Rests of the hilar structures was found normal.

Both the transected ends were mobilized with careful dissection. During operation endobronchial suction was performed through the opening of distal stump. Retained thick mucous secretion was sucked out. Continuity of the right main bronchus

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was restored by an end-to-end anastomosis. Simple interrupted suture with 3-0 vicryl was used. The anastomosis was reinforced with a flap of mediastinal pleura It was

checked by submersion in normal saline and showed no evidence of air leak and full

expansion of the right lung. Chest was closed in layers keeping 2 intercostal drainage tube in situ connecting to water seal drainage system. No positive pressure ventilation was needed. No subsequent air leak was noted.

Chest x-ray on 2°d post operative day showed haziness of the right hemithorax suggesting retained bronchial secretion with associated pneumonitis [Fig 2]. Bronchial toileting with rigid bronchoscope was done on 2°d and 4'f postoperative day. Chest physiotherapy was rigorously used. Right lung became clear. He was discharged on 16'" postoperative day.

Follow up after I month was satisfactory both clinically and radilogically [Fig 3].

Discussion

The pathophysiologic basis of a tracheobronchial rupture includes three mechanisms: (1) a decrease in the anteroposterior diameter of the thorax, (2) sudden increase in intrabronchial pressure with a closed glottis, and (3) rapid deceleration[4]. As the child was playing, the second mechanism appeared to be the cause in this case. The pliability of the chest wall in children allows transmission of massive external forces directly into the mediastinum without disrupting the integrity of the chest wall structure. Absence of rib fractures does not rule out the possibility of major intrathoracic injuries in children[5]. The tentative diagnosis of a tracheobronchial rupture made by the clinical features (dyspnea, subcutaneous emphysema, hemoptysis, retrosternal pain) and by the findings from the chest roentgenogram (pneumothorax, pneumomediastinum) was confirmed by emergency fiberendoscopy[6]. In our patient the bronchial rupture was within 2 cm of origin of the right main bronchus, a classic site described in literature[2,7]. A recent review of 265 patients with blunt tracheobronchial injury showed that 59% were due to motor vehicle accidents, and injuries to the right main bronchus were treated sooner but were associated with a higher mortality than left-sided injuries[7]. It is important to have an accurate bronchoscopic assessment of the location and length of injury before repair, as this will determine the necessary exposure. A patient with a suspected airway injury should undergo fiber optic bronchoscopy for diagnosis and localization

of the injury. Both surgical incision and intraoperative ventilation is dictated by the location of the injury and the surgical approach to the area. Although fiber optic bronchoscopy is mostly used for diagnosis, rigid bronchoscopy also used routinely[8]. We used rigid bronchoscopy as our surgical suite don't have fiber optic one. Surgical repair should follow as soon as the condition of the patient permits[8]. The technique of tracheal and bronchial suturing has been standardized for many years according to recommendations published by Grillo et al. Interrupted, absorbable sutures are used exclusively to allow growth and to avoid the troublesome granuloma problems associated with nonabsorbable sutures[9]. Surgical debridement of the area of acute injury and excision of scarred, narrowed segments of chronic tracheobronchial injuries should be performed to create healthy edges that can be repaired successfully. Often the airway distal to the chronic obstruction will be filled with mucus, which must be removed to allow adequate ventilation of the atelectatic segment. Follow-up bronchoscopy to evaluate the airway anastomosis is recommended at 1 to 2 weeks after operation[7]. Use of intercostals muscle pedicle as an onlay patch repair of tracheobronchial rupture provides adequate lumen by increasing its circumference, tension free anastomosis and prevents stenosis[10]. Non-operative treatment is sited in literature but it should be reserved for patients in whom the laceration is either small (less than approximately 2 cm) and amenable to adequate cuff positioning, or not involving the whole thickness of the tracheobronchial wall, as well as for patients in a poor general condition with a very

high operative risk[6]. Cassada and associates showed that delay in diagnosis is the single most important factor influencing outcome[11]. But Kiser et al. reported no association between delay in treatment and successful repair of the injury[7]. In our case delayed repair which was 14 days from injury did not hinder healing and anastomotic

integrity was satisfactory. Long-term follow-up of these injuries is mandatory to monitor growth and development of the reconstructed trachea[12].

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REVIEW ARTICLE

Physics of Ultrasound

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[Chest & Heart Journal 2008; 32(2) : 100-105]

History

Concept of ultrasound was known in the late 1800. The first major attempt at a practical application was made in the unsuccessful search for sunken Titanic in the North Atlantic in 1912.

SONAR- So- Sound, N- Navigation, A- And, R- Ranging was the first important successful application.

Successful medical applications began shortly after the war, in the late 1940s & early 1950s. Tremendous progress has been observed in 1960s decade with B- mode engaging & gray scale presentation.[1]

Sound

Sound is a kind of mechanical energy and is produced by vibration of any object. The energy of sound is transmitted in the form of wave & require a media for its propagation[2] (light is also a kind of energy but requires no media for its propagation).

Audible Sound- 20 Hz to 20 KHz

Inaudible sound-

Infra sound- below 20 Hz

Ultrasound- above 20 KHz

Medical Ultrasound

For medical purposes ultrasound is used in the range of 1 MHz to 10 MHz.

Factors Related to Ultrasound

Frequency- Numbers of cycles per unit time. Unit- Hertz

Cycle- One complete motion of particle is called one cycle.

Amplitude- Maximum displacement of voluntary particle.

Time period- The time taken to complete one cycle.

Wavelength- The distance caused during one complete cycle.

Frequency is inversely proportional to time period and wave length.

$F = 1/T = 1/\lambda$ (F- Frequency, T- time, λ- Wave length)

Sound requires media for its propagation and velocity of the sound depends on the density of the media. Higher the density greater will be the velocity of the sound in that media. In a dense media the molecules are move close to each other as compared to a lighter media. Hence the mechanical vibrations move faster in a dense media[3]

For example, velocity of sound in air is 330 m/sec, in water is 1487 m/sac, in soft iron 5957 m/sec, soft tissue- 1540 m/sec, bone- 4020 m/sec.

Generation of Ultrasound

In nature these is a crystal called the quartz. This crystal has a special property of producing electricity when pressure is being applied. This is known as piezo- electric effect. The reverse is also true, i.e. if electricity is applied pressure will be felt and the crystal will undergo physical deformations. This effect is called the reverse piezoelectric effect. It is by this process that ultrasound in produced inside the probes of a ultrasonogram machine.

Intractions of Ultrasound with Matter

Attenuation

Attenuation to be the progressive weakening of sound beam as it travels through the tissue. It depends on-

1) Type and density of the tissue.
2) Degree of heterogenicity of the tissue.
3) Number and type of echo inter faces in the tissue.

Average attenuation of ultrasound beam in human soft tissue is 1 dB per cm/mhz.[4]

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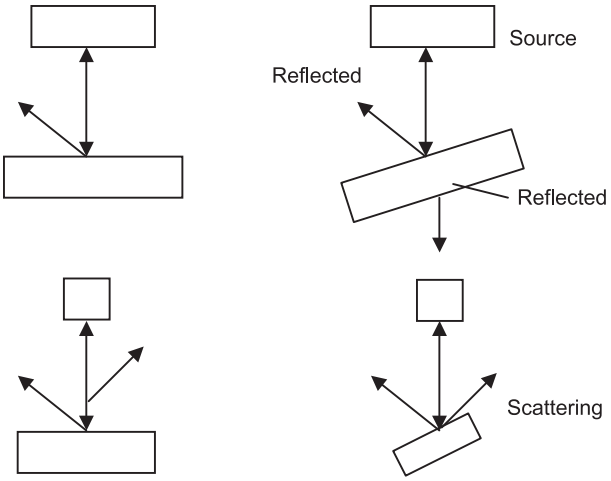
This means that an ultrasound beam with a frequency of 1 MHz loses one dB of amplitude for every cm it travels. We must multiply the attenuation by 2 as because the ultrasound beam after reflection coming back to the source.

Absorption

Energy of sound beam is absorbed by the tissue. Most of the energy is converted to heat in the tissue. This process serves as a basic for therapeutic use of ultrasound.

Reflection

It is the redirection of ultrasound beam back towards its sources.



It occurs when the ultrasound beam strikes an acoustic interface. All acoustic media has acoustic impedance.

Z = P x C Z – acoustic impedance
P – Density of acoustic media
C – Velocity of sound

Scattering

When the ultrasound beam strikes an interface which is irregular a portion of the beam will be scattered in all directions.

Rerfaction

Bending of ultrasound beam when it crosses at an oblique angle the surface-surface interface.

ECHO

Reflection of sound beam can also be termed as an ECHO. However one must remember that healthy human ear is not capable of separating sound wave if the time difference between them is less than 0.1 see.

Specular reflection occurs when the interface is larger than the sound beam.

Resolution

It is the ability to separate two closely spaced interface. Resolution is expressed as a distance, e.g. 3mm, it means that two small interfaces spaced only 3mm apart will appear as two separate ECHOs in the image.

If the two interfaces are closer together e.g. 2mm. They will appear as a single ECHO in the picture. If frequency increases resolution will increase.

Vital Ingradients of Sonic Imaging System

1) Transducer
2) Display method (CRT/Television monitor)
3) Computer, printer & other accessories.

Transducer

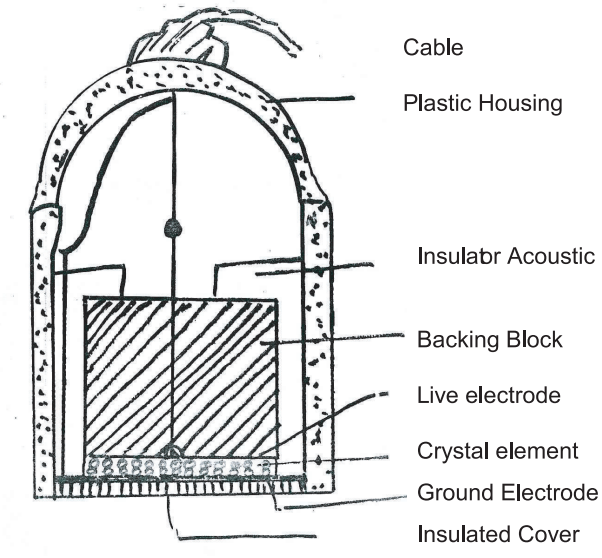


Fig. *USG Transducer*

Transducer is a device that can convert one form of energy into another. Ultrasonic transducer is used to convert an electric signal into ultrasonic energy that can be transmitted into tissues and to convert ultrasonic energy reflected back from the tissues into an electric signal.[5]

Mechanism of Transducer Action

When a high voltage, between 300-700v is applied to apposite faces of the crystal, it expands slightly. If the voltage is turned off the crystal returned to its original position. If the voltage were reapplied, but with opposite polarity, the crystal would shrink

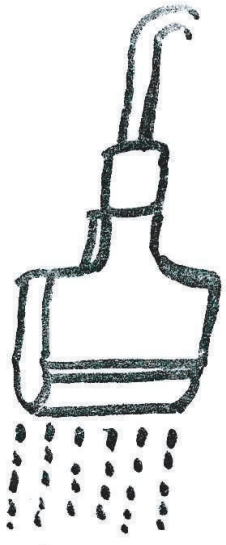
slightly. These tiny expansion and contractions of the crystal caused by an alternative current will produce small pressure waves which are transmitted as ultrasound pulses. When the crystal comes into contract with patient's skin, these pressure waves are transmitted to the tissues as USG beam. Conversely ECHOs returning to the crystal from tissue will deform the crystal slightly and thus cause an electric voltage to be produced. The greater the amplitude of the returning echos, greater the change in shape of the crystal and thus the higher the voltage generated. The electrical information is then processed by the ultrasound apparatus and is eventually displayed on the screen of the cathode ray tube (CRT).

Transducer Frequency

Transducer come in many different frequencies-typically- 2.5, 3.5, 5 & 7 MHz. 10 MHz transducer is under consideration of marketing. Increasing the frequency improves resolution but decreases penetration. Decreasing the frequency increases penetration but diminishes resolution. Higher frequency is used for superficial scan and lower frequency is used to scan the deeper structure.

Transducers of Different Shapes

1. Linear Array

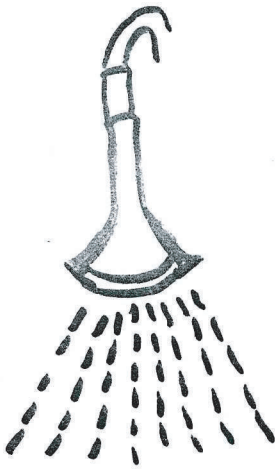


Scan from this type of transducer are rectangular. They are most useful in obstetrics and for scanning the breast and thyroid.

2. Sector Scanner

These scans are fan shaped, almost triangular and originates through a very small acoustic window. These scanners can be used whenever there is only a small space available for scanning. They are most useful in the upper abdomen, for gynaecological and cardiological examination.

3. Convex Transducer



This produces a scan somewhere between those of the linear and the sector scanner and is therefore useful for all parts of the body except for specialized echo cardiography.

Different Modes of Ultrasound

1. A- Mode
2. B- Mode
3. M-Mode
4. Real Time

A- MODE (AMPLITUDE MODE)

Earliest display form of ultrasound. It consists of an oscilloscope mapping of received voltage on y-axis & time on x-axis.

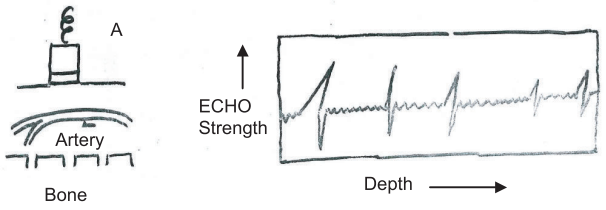


Fig.: *A mode imaging displays an artery as two amplitude of spikes.*

B- Mode (Brightness Mode)

Imaging yields a two dimensional cross sectional spatial representation of the examined tissue on the horizontal and vertical axis. Images are formed by assigning a degree of grayness to voltage amplitude values and displaying this gray levels on an image.

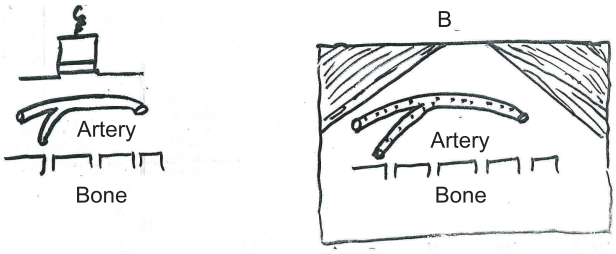


Fig: *B-Mode creates a two dimensional image of an artery (x-y axis)*

M-Mode (Motion mode)

Imaging is used in echo cardiography, usually in conjunction with B-mode image which are generated rapidly enough to image the beating heart. M-mode image displays straight lines paralleled to the face of the transducer. The strength of returning echos is translated into voltage and the voltage amplitude are mapped into gray levels.

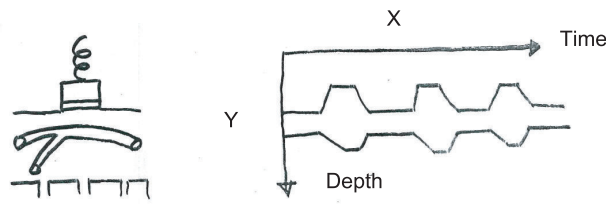


Fig.: *M- Mode imaging displays only one section of artery overtime. The pulsation of the wall of the artery is shown on Y axis, time is shown on X- axis.*

Real time

When multiple B-Mode images are watched in rapid frequencies, they become real time images, usually used to study the moving parts of body.

Special transducers

Special transducer have been produced to help view specific areas.

1. Small parts (5, 7.5 and 10 MHz) Transducer
2. Rectal Transducer in longitudinal (Linear) and transverse (radial) configurations.
3. Transvaginal- transducer
4. Biopsy Transducer- with special device to attached biopsy needle.
5. Doppler Probe
6. Intra-operative Probe: for penetrating small orificies (e.g. imaging the brain via bones hole) or for imaging flat organs (e.g. linear array for liver).
7. Transluminal Transducer for assessing vessels, ureters and the common bile duct (CBD).

Artifacts in ultrasound image

Some ultrasound artifacts can lead to misdiagnosis, other artifacts aid in diagnosis. Examples of artifacts that aid diagnosis are enhancement and shadowing behind the lesions.

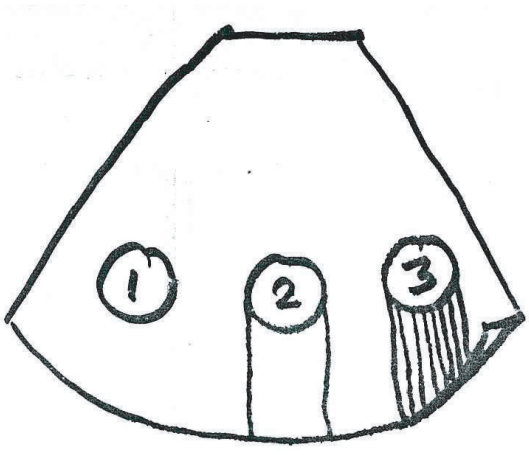


Fig. 1) No change in attenuation.

2) Increased attenuation

3) Enhanced transmission

Artifacts

1) Posterior shadowing
When the lesions are more dense or calcified-posterior shadowing is seen e.g. gall stone and renal calculi. Shadow also seen when ultrasound beam encounters air in the body. Critical angle refraction which looks likes a shadow.[6]

2) Posterior enhancement
Posterior enhancement occurs in less attenuated tissue used to diagnose fluid filled mass from solid mass, cyst, hematoma, abscess- has post, enhancement. Fibroadema Breast- Posterior enhancement.

3) Anechoic masses
Masses assumed to be solid if they have internal chos and show no posterior enhancement. If enhancement is present the mass is cystic, occasionally we may see echos within a mass that are artifacts. This echos occur if the gain or power is too high.

4) Phantom mass
When a highly reflective boarder occurs near an ancehoic region can create a artifactual tumour behind the diaphragm. When gain is reduced or the direction of the beam is changed the artifactual tumour will disappear.

5) Revervations
This occurs because of the large acoustic mismatch between the skin and transducer. This is due to back & forth scattering take a longer time to return then primary beam also called partial volume effect similar found in C.T.

6) Beam thickness
When a neonatal head or curved surface is imaged, the surface on the side wall will be thicker them the top.

7) Duplication artifact
When the beam enters the Rectus abdominis muscle transversely the muscle and fat layers refract the beam and census the appearances of double gestational sac or double head boundary.

Doppler ultrasound

Doppler effect & doppler shift

When ultrasound is transmitted towards a stationary reflector the reflected waves will be of same frequency as those originally transmitted.

If the reflector is moving towards the transmitter the reflected frequency will be higher than the transmitted frequency.

If the reflector is moving away from the transmitter the reflected frequency will be will be lower than the transmitted frequency.

The difference between transmitted & received frequencies is proportional to the speed with which the reflector is moving away or approaching the transmitter. This phenomena is called Doppler effect and a difference between the frequencies is called Doppler shift.[7]

Types of doppler

A. Continuous wave doppler

Probe contains two transducer crystal. One transmits continuously and other received continuously. The Doppler shift is calculated and display.[7]
as audio signal.

Indication- a) Arterial pulse
b) Perfusion pressure
c) Venous reflux

B. Duplex doppler
Real time imaging with pulse Doppler. Vessels are located by B-mode ultrasound imaging & blood is measured by Doppler ultrasound.[8]

Doppler effect

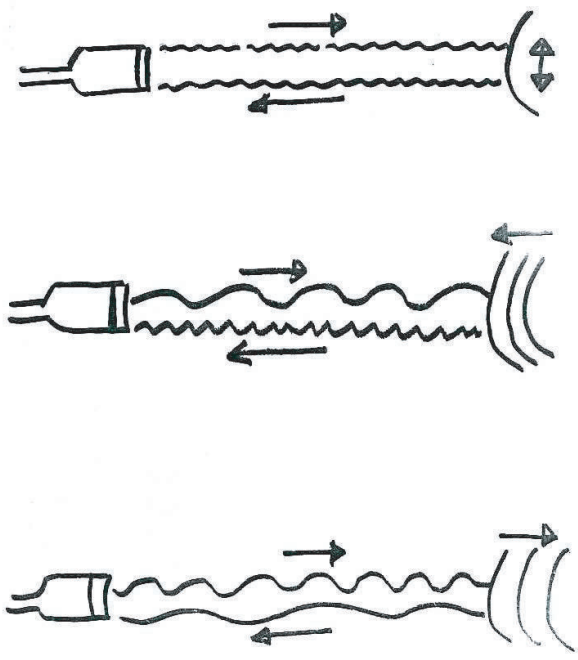


Fig. *Diagrammatic representation of Doppler effect*

C. Colour doppler

The distribution and direction of flowing blood are shown as a two dimensional image in which the velocities are distinguished by different colours.

D. Power doppler

The strength of the Doppler signal depends on volume of blood reflecting the sound pulsed and the velocity at which it is traveling.

Doppler criteria

Peak systolic velocity - A

End diastolic velocity - B

Resistance Index (PI) - $\frac{A-B}{A}$

Pulsatility Index (PI) - $\frac{A-B}{T_A \text{ max}}$

T_A max- Time averaging maximum

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