

# DocConnect

Professional Writings by Medical Practitioners, Max Super Speciality Hospital, Saket

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## Novalis Certifies Radiation Oncology

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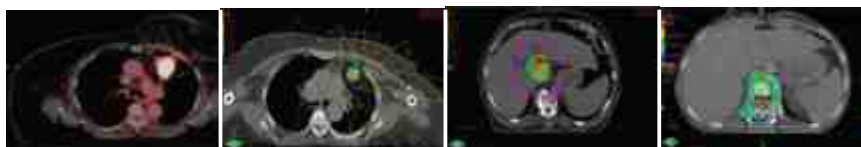
Max Cancer Centre takes great pride in announcing that it is now Asia Pacific's first, Radiation oncology centre to get the coveted international "Novalis Circle Accreditation" for quality and safety requirements for Stereotactic Radiosurgery (SRS) and Stereotactic Body Radiotherapy (SBRT) programmes.

The Novalis Certification process is a vital step to establish the highest standards of safety in the delivery of SRS and SBRT for cancers of the brain, spine, lungs, liver, head and neck and beyond. In order to help us accomplish this level of excellence, we have a dedicated audit process with which we evaluated the procedures and protocols for various cancer treatment programs. It facilitates a culture of continuous improvement and the highest safety for the goal to provide every patient a consistent, safe, accurate treatment to achieve best possible local control for improved survival.

This has been demonstrated in an external audit conducted in January 2013 covering organizational, personnel, and technology and quality assurance requirements.

The SRS and SBRT programme started at Max Cancer centre with the installation of the state of art Novalis Tx at its inception in 2009.

The first frame based Radiosurgery treatment was in February 2010 and the centre has subsequently moved on to "frameless" Radiosurgery using "Exac trac imaging" and 6D robotic couch since February 2011. We are currently treating more than 100 cases of both malignant and benign brain tumours annually.



A patient with early cancer of lung treated with SBRT

SBRT Technique for Lung tumour

Liver Tumour treated with SBRT

Spine tumour treated with SBRT

The Stereotactic Body Radiation Therapy (SBRT) treatment for spine started in March'10 and we presently treat about 10 cases a month including metastatic and primary spinal tumours.

Exact trace based adaptive gating with the help of radio opaque implanted gold viscoil markers has also been implemented at Max Cancer Centre for the treatment of both primary lung,

liver and metastatic tumours since the spring of 2011.



## Laparoscopic Retrieval of an Unusual Foreign Body

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### ABSTRACT

Ingestion of foreign body is a serious problem commonly encountered in our clinical practice. Most of them pass spontaneously whereas in others endoscopic or surgical intervention is required because of complications or non passage from the gastrointestinal tract. We present here a case of teaspoon ingestion which did not pass spontaneously. Laparoscopic retrieval of teaspoon was done from midjejunum after enterotomy and the patient recovered uneventfully. Right intervention at the right time is of paramount importance.

### INTRODUCTION

Foreign body ingestion is a common cause of accidental death. Although approximately 90% of them pass spontaneously, they can result in perforation or obstruction in the gastrointestinal tract. Toddlers aged 2-3 years are most commonly affected; as children in this age group are ambulatory and more orally explorative.<sup>(1)</sup> Intestinal perforation by a foreign body is uncommon occurring in less than 1% of patients. It normally affects the ileocaecal and rectosigmoid regions. According to Goh et al, the most common site of intra-abdominal perforation as the terminal ileum (approx. 39%).<sup>(2)</sup>

We present a case of young female with ingestion of foreign body which was impacted in small intestine.

### KEYWORDS

Foreign body, Enterotomy, Laparoscopy, Small intestine.

### CASE REPORT

A 23 years old female presented to the emergency of the Max Super Speciality Hospital, Saket with history of ingestion of teaspoon

while she was eating ice cream one day before. She complained of pain abdomen and nausea. Physical examination revealed soft abdomen with mild tenderness around umbilicus and no signs of peritonitis. A plain X-ray abdomen revealed presence of a radio-opaque foreign body (metallic teaspoon) in the stomach. Initially we decided to observe and closely monitor the patient after admitting her and starting conservative expectant treatment. The next day she was not relieved and the abdominal pain continued. In view of that, we took the decision to proceed with diagnostic laparoscopy. Repeat x-ray abdomen was performed in erect and supine position to locate the position of the teaspoon (Figure 1).

Diagnostic laparoscopy was performed with one 10mm and two 5mm midline ports. On initial evaluation, the bowels looked normal. There were no bowel adhesions. On exploration and careful examination of upper GI tract jejunum was found to be dilated. On tracing the loop of jejunum the spoon was located at the mid Jejunal level. Enterotomy was performed on the antimesenteric border and tablespoon identified and was retrieved (Figure 2 and 3) Enterotomy closed with Endo GI stapler. Patient had an

uneventful post operative recovery and was ultimately discharged on postoperative day 4.

Figure. 3



### CONCLUSION

Patients with history of ingestion of gastrointestinal foreign bodies should be diligently monitored. The most optional method of retrieval in the form of endoscopy or surgery should be contemplated at the earliest indication. Laparoscopic retrieval may be better option in comparison with laparotomy where facility and proper expertise are available.

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Figure. 1



Figure. 2





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## ABO Incompatible Renal Transplant – need of the time?

The shortage of donor organs, especially in renal transplantation, leads to an increasing discrepancy between the number of end-stage renal disease patients on waiting lists and the number of available deceased donor kidneys. Expansion of the donor pool can be achieved by increasing the numbers of living kidney transplantation and by overcoming the immunological barriers of ABO-incompatibility and HLA-sensitization.

We present the case of a 25 years male resident of Delhi. He is a case of biopsy proven FSGS not responding to steroids and MMF and gradually progressed to ESRD. Patient had history of hypertension for 8 years on regular treatment. In view of absence of any suitable blood group matching donor in family his father was accepted as prospective donor for ABO incompatible transplantation. Blood group of recipient O+ve and donor B+ve. HLA Typing done showed 1/6 mismatch (HLA-A). After necessary clearances and thorough work up his ABO Incompatible transplant was planned. His Anti- B (IgG Titers) prior to pre-conditioning were (1:128). He was given Inj Rituximab

decreased from 5.1 mg/dl on POD 0 to 1.0 on POD 3. Regular monitoring of tacrolimus levels were done and doses were modified accordingly. Patient remained stable and was discharged on POD 7 on serum creatinine of 1.1 mg/dl. He had an episode of urinary tract infection over next few days which responded to iv antibiotics and DJ stent was removed. Patient presently is doing well with serum creatinine values of 1 mg/dl.

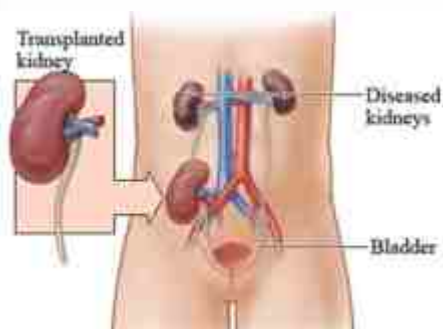
### DISCUSSION

Despite a substantial increase in the number of patients, receiving living kidney transplant, otherwise suitable donors have to be rejected due to pre-existing human leukocyte antigen antibodies or ABO-incompatibility. Isoagglutinins (ABO-antibodies) represent a major barrier in optimizing living kidney donation and organ distribution. As blood group antigens are expressed by the endothelium of solid organs including the kidney, transplantation across the blood group barrier can result in hyper-acute antibody mediated allograft rejection. Depending on blood group distributions in different populations, as much as 30–35% of potential living donors have to be excluded from living donation due to ABO-incompatibility. ABO-incompatible transplantation was already performed as early as in the 1970s, but due to hyper-acute rejection, results were discouraging. In 1987, Alexandre et al.<sup>[1]</sup> published a first series of 26 ABO-incompatible kidney transplantations using splenectomy and an immunosuppressive regimen with steroids, cyclosporine, azathioprine, anti-thymocyte globulin and donor-specific platelet transfusions. Published data demonstrated an excellent long-term outcome of ABO-incompatible living donor

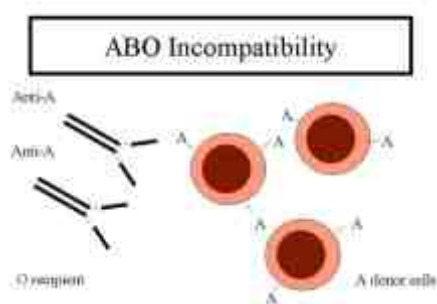
kidney patients in Japan.<sup>[2]</sup> Similar successful short term results have been shown for protocols developed in Europe and the United States. Different approaches to performing successful ABO-incompatible kidney transplantation have been used in different countries over the last decade.

The first series of AO-Bincompatible renal transplantation without splenectomy, using antigen specific immune-adsorption and rituximab, was published by the Stockholm group of Tyden et al.<sup>[3,4]</sup> In 21 patients successfully treated with this protocol, the immunosuppressive regimen consisted of one dose of rituximab (375 mg/m<sup>2</sup>) given 2–4 weeks before immune-adsorption, followed by a conventional triple-drug immune-suppression consisting of tacrolimus, mycophenolate mofetil and prednisolone, starting 1 week before immune-adsorption. Pre-operatively, anti-A or anti-B antibodies were removed using the Glycosorb ABO column, a low-molecular carbohydrate column with A or B blood group antigen /linked to a sepharose matrix. Immunoabsorption with Glycosorb columns is very effective, and IgG and IgM isoagglutinin titres can be reduced by two to three titre steps with every immunoabsorption session. Four pre-operative immunoabsorption sessions were performed, aiming for a pre-operative ABO antibody titre of <1:8. After the last pre-operative session, 0.5 g/kg of intravenous immunoglobulin (IVIg) was administered. To avoid early post-operative rebound of ABO antibodies, three more immunoabsorption sessions were done over a period of 9 days. Based on their data with a maximum follow-up of 4 years, it can be said that there were no major side effects of the treatment regimen, patients showed normal serum creatinine levels and no late reappearance of iso-agglutinins was observed during follow-up.<sup>[5]</sup>

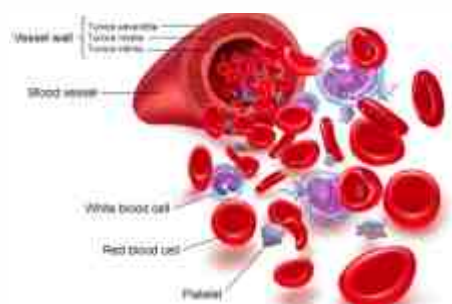
In our patient we have been able to achieve good and successful result with the use of pre-transplant glycosorb immunoabsorption with standard immunosuppression with Calcineurin inhibitors, mycophenolate mofetil, steroids and anti-CD-20 monoclonal antibody. Patient did not require post-transplant immunoabsorption



(500mg) and initiated on immunosuppression with tacrolimus (0.1mg/kg) and immune-adsorption was performed by glycosorb filters. A titer of 1:1 were achieved after 2 sessions of immune-adsorption. As the titers approached their lowest values, his surgery was planned. Induction given by inj. thymoglobulin (1mg/kg/day) for 2 doses. Post-operative he had urine output of 100ml in two hours which gradually improved. Over next 24 hours his urine output improved. Titers were monitored and remained < 1:4. His renal parameters gradually improved and serum creatinine



and neither was use of IVIg necessitated thus preventing extra costs.



Immunoadsorption finds incremental implementation in the treatment of several autoimmune disorders as well as for kidney transplant indications. Advantages are a not only a more specific but also a more effective clearance of circulating immunoglobulins without the side effects associated with the substitution of fresh frozen plasma or albumin. Multiple plasma volumes may be processed, and

a reduction of immunoglobulins of 80% and more is feasible. The Glycosorb ABO column is a single use column that efficiently reduces donor-specific anti-A and anti-B IgM and IgG at 81% and 56%, respectively, at the first treatment.

## CONCLUSION

ABO incompatible transplant is the need of the time, especially in a country like India where cadaveric transplants form a very minuscule percentage of total number of donors and patient has to depend on close family relatives for kidney donation whose chances decrease substantially at times due to abo-incompatibility. Different protocols have been used by different institutes in various countries. Cost of therapy and co-morbidities associated play a major role in the final decision. Need is to evolve constantly so as to achieve minimum co-morbidity with successful outcome and maximum cost-benefit to the patient and family.

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## Detection of Left Ventricular Anomalous Hypertrophied Muscular Band by MRI and Correlation with Echocardiography – a case report

### ABSTRACT

Anomalous hypertrophied muscular band (HMB) are anatomic variants of the normal human left ventricle which may be detected by two-dimensional echocardiography. Left ventricular muscular bands can stretch across the left ventricle from the septum to the free wall. They can also tether to a papillary muscle, but unlike the chordae tendineae, do not connect to the mitral leaflets. They are anatomic variants that should not be mistaken for abnormalities such as thrombus, tumors, sub aortic membranes, thrombus borders, and septal hypertrophy. They have been noted in patients with murmurs and arrhythmias.

A 29 yrs old patient approached the cardiologist for vague chest pain and discomfort.

He was a non-alcoholic, had no cardiovascular risk factors, and his family history was unremarkable. His initial vital signs were stable,

and other physical examinations showed non-specific findings except for the irregular heartbeat. Echocardiography showed hypertrophied left ventricular wall and papillary muscles in left ventricle. A band like structure was seen extending from septum and inferior wall which are meeting in mid cavity and forming a "V-shape configuration. Provisional diagnosis of this band on echocardiography was hypertrophied muscular band of left ventricle forming "V" shaped configuration. MRI was done which showed consistent findings.

### CASE REPORT

A 29 yrs old patient visited our hospital for vague chest pain. He approached the cardiologist who advised him for an echocardiography. He was a non-alcoholic, had no cardiovascular risk factors, and his family history was unremarkable. His initial vital signs

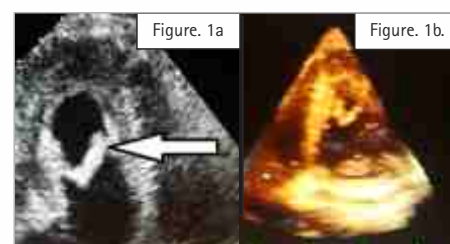


Figure.1a and 1b. Echocardiography showing concentric hypertrophy of left Ventricle with apical prominence and band like structure meeting in mid cavity forming A "V-shape configuration (arrow).

were stable, and other physical examinations showed non-specific findings except for the irregular heartbeat. Echocardiography showed concentric hypertrophy of left ventricle with apical prominence and band like structure which is meeting in mid cavity forming a "V-shape configuration was considered as muscular band. MRI was done which showed consistent findings. There was concentric hypertrophy of

left ventricle with apical prominence with end diastolic wall thickness of (11mm). There was hypertrophy of papillary muscle and evidence of hypo intense lesion projecting from septum and inferior wall in the cavity and forming a V shaped configuration (Figure 2 a and b).

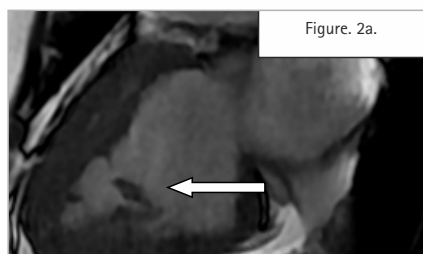


Figure. 2 a two chamber image showing hypertrophy of papillary muscle and evidence of hypo intense lesion projecting from septum and inferior wall of left ventricle in the cavity and forming a V shaped configuration. (arrow)

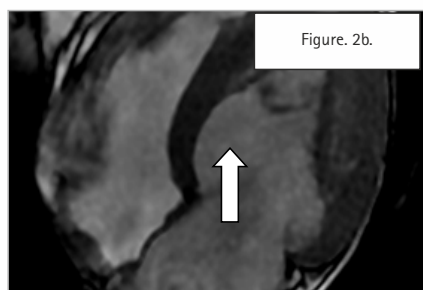


Figure. 2 b four chamber image showing increased wall thickness with a hypo intense mass like lesion projecting from septum and inferior wall of left ventricle in the cavity and forming a V shaped configuration (arrow)

**LV regional function:** Mild hyperkinesias of mid septal and mid inferior wall noted.

**Resting perfusion:** First pass perfusion images demonstrate normal arrival of contrast in all myocardial segments and V shaped lesion.

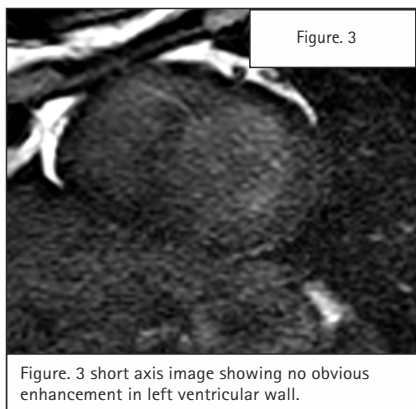
**Delayed Enhancement:** No obvious delayed enhancement noted in ventricular wall, septum, papillary muscles and in the V shaped lesion (Figure 3).

## QUANTITATIVE ANALYSIS

Quantitative functional parameters obtained from integration of left ventricular volumes at end diastolic and end systolic are as follows:

- LVEF—60%
- LVEDV—91.7ML
- LVESV—34.8
- SV—56.9ML
- CO—5.2 L/MIN

Final Impression after correlating MRI and Echocardiography was mild Left ventricular



hypertrophy with prominent papillary muscles. Band like lesion projecting from septum and inferior wall into the cavity forming V shaped configuration which is showing enhancement and tissue characteristics similar to myocardium was considered as hypertrophied muscular band a normal variant.

## DISCUSSION

Fibro muscular bands have been observed in normal and abnormal hearts. Of patients undergoing echo-cardiographic examinations, Nishimura et al reported an incidence of 0.5% in 1000 patients. However muscular band with V shaped configuration and meeting in the cavity is never reported before. LV bands may pass between papillary muscles, from papillary muscle to the ventricular septum, between free walls, or from free wall to interventricular septum, in contrary to true chordae tendineae connecting papillary muscle and mitral valve leaflets. In echocardiography, LV bands appear as string-like bands passing LV cavity which may be transverse, longitudinal, or sagittal, and single or multiple. The location, direction, length and thickness of LV bands may vary depending on their embryonic origin of inner cardiac muscle layer and contents. Muscular bands become shorter and thicker in systole, and vice versa in diastole. Fibrous bands become straight and taut in diastole, and vice versa in systole. Off-axis images demonstrating the overall length of bands, normal LV structures on both ends, and constant motion during cardiac cycle are the key features<sup>(1)</sup>.

The presence of left ventricular fibromuscular bands is usually considered to be of no clinical significance. However, Suwa et al described a patient with idiopathic left ventricular tachycardia in whom a fibromuscular band was noted extending from the basal interventricular septum to the inferior endocardium near the apex. The earliest ventricular activation during

ventricular tachycardia in this patient appeared to correspond to the apical insertion of the fibro muscular band.<sup>(2,3)</sup>

A hypertrophied muscle band in Left ventricle can sometimes mimic thrombus, apical cardiomyopathy or LV mass<sup>(4)</sup>. It is otherwise a rare echo-cardiographic finding in patients with normal LV wall thickness. In our case study hypertrophied muscular band was associated with mild left ventricular hypertrophy. Sometimes these bands may be associated with rhythm disturbances but most of the cases have benign course. We confirmed our finding by cardiac MRI which is better for tissue characterization.

Two-dimensional echocardiography in cases of hypertrophied muscular band shows echogenic thickened band like structure connecting septum to any other wall of left ventricle. In our study muscular band is connecting septum and inferior wall with a V shaped configuration and meeting in mid cavity which is rare and never reported before. On MRI the hypertrophied muscular band looks similar to surrounding myocardium and shows same enhancement as myocardium does on post contrast study. There is no delayed enhancement noted as does the normal myocardium. The differential diagnosis were thrombus or mass. Thrombus is T1 hypo intense (darker) as compared to normal muscle. It usually does not enhance except chronic thrombus which shows delayed enhancement. Mass usually shows mild to moderate enhancement and have different tissue characterization as compared to normal myocardium. In conclusion, HMB, thrombus or mass can be misinterpreted with each other, the differential diagnosis between these are important. In our study both MRI and Echocardiography correlation was helpful in reaching the diagnosis.

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## Successful Surgical Repair of Giant Left Ventricular Aneurysm with Ventricular Septal Defect & Severe Left Ventricular Dysfunction

### BACKGROUND

Most cardiac aneurysms develop after myocardial infarction. Post myocardial anteroseptal dysfunction or akinesia is treated by septal reshaping to improve outcome in patients with left ventricle dysfunction.

The purpose of the surgical repair was, to alleviate the deleterious effect of previous myocardial infarction by excluding the nonfunctional scarred area to achieve the original geometry of the ventricle along with myocardial revascularization and to close the ventricular septal defect. The innovative way to repair these two mechanical complications of myocardial infarct is described here.

### CASE HISTORY

A 56 yr old gentleman presented with breathlessness and chest discomfort since 11 days. On admission in a local hospital of Kathmandu, Nepal he was diagnosed a case of acute myocardial infarction. He was treated conservatively over there.

He showed up in Max hospital, Saket on June 26 with dyspnea on exertion. After admission on clinical examination he had pansystolic murmur best heard in apical area. The 2D-ECHO revealed large apical left ventricular aneurysm with possibly concealed rupture and large apical VSD. He underwent coronary angiography which revealed 100% LAD occlusion. Left ventricular angiogram further confirmed large apical LV aneurysm having two separate openings draining into right ventricle. He underwent coronary artery bypass surgery, LAD endarterectomy, VSD closure and Dor procedure for LV aneurysm.

### TECHNIQUE

The patient with anterior wall myocardial Infarction, VSD and severe LV dysfunction underwent closure of the septal defect with double Velour Dacron patch and then septal reshaping was done. All the dyskinetic and akinetic septal areas were excluded using an oval Dacron patch sutured from healthy septal area to the anterior wall, resulting in a formation

of a new apex. After LAD endarterectomy, vein graft was put on LAD. Intra aortic balloon pump was inserted electively at the time of induction.

### POST OPERATIVE COURSE

He was extubate on day one. Balloon pump was removed on day 2. His inotropes were weaned off on day 3 and shifted to room the same day. His post operative course remained uneventful. Post operative ECHO was satisfactory, it was seen that this procedure resulted in significant reduction in left ventricular volume, increase in ejection fraction and improvement in NYHA class and a better apical geometry. This technique of septoventricular exclusion is a desirable surgical procedure for ventricular restoration. It preserves an adequate diastolic volume and provides better hemodynamic stability. He was discharged on day 8.

### CONCLUSION

In patients with anteroseptal dyskinesia or akinesia septal exclusion provides good clinical and morphological results with improvement in ventricular function.



Figure. 1 Schematic Diagram of Aneurysm Showing Akinetic Segment



Figure. 2: Pre-operative picture before repair showing infarcted LV apex



Figure. 3 Pre-operative: VSD Repair with DVD patch & interrupted plegged sutures



Figure. 4 Post Repair: Teflon felt enforced closure after or and vein graft to LAD



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## Effect of Respiratory Muscle Training with Device for Pulmonary Physiotherapy in Community Dwelling Elderly of New Delhi, India

There is a need to highlight the medical problems that are being faced by the elderly people in India, and explore the strategies for bringing about an improvement in their quality of life.

**Objective:** To evaluate effect of Device for Pulmonary Physiotherapy (DPP) (Smart Breathe) on mobility status and community life of elders.

**Design:** Pre test post test design

**Setting:** Chattarpur Extension, New Delhi, India.

**Subject:** 37 elders were recruited using convenient sampling from members belonging to local senior citizen organization at Chattarpur Extension, New Delhi (n\_37).

**Method:** Six physical therapists were trained on protocol of breathing exercises with device for pulmonary physiotherapy (DPP). Demographic profiles of older people were documented on the ICF Checklist Version 1A before starting the intervention. After correction of breathing pattern, breathing exercises started using DPP with increasing duration from day 2 to week 20. Components of Geriatric ICF core set reassessed at the end of week 8 and week 20.

**Result:** The study illustrates significant improvement in sensations associated with cardiovascular and respiratory functions, mobility status and community life of elderly.

### CONCLUSION

Using the pulmonary physical therapy and training device helped older people with sensations associated with cardiovascular and respiratory functions. The study showed improved mobility of subjects around their house and community life.

### KEYWORDS

Respiratory muscle training, Device for pulmonary physiotherapy, Community dwelling elderly, India is in a phase of demographic transition. As per the 1991 census, the population of the elderly in India was 57 million as compared with 20 million in 1951. India has acquired the label of "an ageing nation" with 7.7% of its population being more than 60 years old.

In India, the elderly people suffer from dual medical problems, i.e., both communicable as well as non-communicable diseases. In the population over 70 years of age, more than 50% suffer from one or more chronic conditions<sup>[1]</sup>. According to Government of India statistics on elderly mortality, respiratory disorders account for about 10% of total mortality<sup>[2]</sup>.

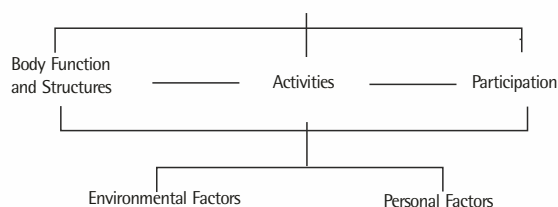
A cross sectional study conducted in Chandigarh, India by Malhotra G ET. AL (2014), reported activity limitation was significantly more prevalent in the elderly aged over 70 years and performance restriction was significantly more prevalent in the elderly staying with family

compared than those who stayed alone. This has been the major cause of social isolation and mental diseases in elderly in India<sup>[3]</sup>.

Breathing is a major function of the body, which has an impact on state of health. Breathing exercises can influence the involuntary (sympathetic nervous system) that regulate blood pressure, heart rate, circulation, digestion and many other bodily functions therefore can be an effective ways to normalize different health parameters, and also increase the level of physical performance capacity and therefore better participation in activities of daily life. As older people who are more susceptible to chronic diseases, age related associated diseases (co morbidity), decline/loss of social support, atypical clinical presentations and special diagnostic problems make the elderly patient with respiratory disease, a complex client for a physician<sup>[4]</sup>. Much of the disease burden in rural India is due to respiratory disease, namely asthma, bronchitis, tuberculosis and pneumonia<sup>[5]</sup>.

The respiratory mechanics of an elderly is different in that energy is not drawn as effectively from breathing as in young. Therefore, during exertion a tachypnoeic shift may result, which is defined as increased rate of breathing at the expense of maintaining tidal volume<sup>[6,7,8]</sup>. A subsequent increased work of breathing may cause blood stealing (blood diverted from working peripheral muscles to the respiratory muscles to meet increased demand) as well as respiratory muscle fatigue and increased dyspnoea which affects performance<sup>[9,10,11,12]</sup>. This explains early fatigue and dyspnoea in elders as compare to their younger counterparts, which require appropriate intervention. Resistance breathing exercises has long been known to medicine. The concept of resistance breathing exercise with a breathing device has been utilized in this study. This Device for Pulmonary Physiotherapy (DPP), Smart Breathe works on the concept of improving expiratory muscle strength by incorporating a pressure threshold valve that provides resistance during expiration. The study has focused on monitoring effect of DPP on mobility status and community life of elders.

International Classification of Functioning, Disability and Health (ICF) is a multipurpose classification, which belongs to the WHO family of international classifications. The classification is organized in a hierarchical structure comprising of two main parts, each with separate components. The first part consists functioning and disability with 3 components: Body Functions (coded b) and Body Structures (s), and Activities and Participation (d). The second part of ICF encompasses contextual factors, and has two components: Environmental Factors (e) and Personal Factors (not coded)<sup>[13]</sup>.



The Geriatric ICF Core Set is a selection of categories out of the entire classification that can serve as the minimal standard of the assessment and reporting of functioning and health. Since we were interested in the modifiable physical condition as potential determinant of self-efficacy, categories of the ICF components body functions, activity, participation, and environment of the Geriatric ICF Core Set were used for assessment.

## METHODS

Six physical therapists were trained (12 hours in 2 days) on breathing exercises protocol with the Device for Pulmonary Physiotherapy (DPP). The therapists underwent training (20 hours in 3 days) on International Classification of Functioning. 37 elders were recruited using convenient sampling from members belonging to local senior citizen organization, according to the inclusion criteria i.e. male or female >60 years of age with cognitive level, MMSE >23. Elderly having cardiac arrhythmias or cardiac pacemakers were excluded from the study. All participants provided written informed consent for the study. Seven subjects were excluded from the study due inability to adhere to the protocol. Duration of the study was 20 weeks. Institutional review board approval was obtained at Max Super Speciality Hospital.

Demographic profile of age sex marital status, employment status, and prevalence of disease, was documented on the ICF Checklist Version 1A. Information of subjects on selected items codes (Table 1) from activity and participation and body functions from ICF Geriatric Core Set was recorded. Each subject was given a Device for Pulmonary Physiotherapy (DPP). Before using device for Pulmonary Physiotherapy (DPP) subjects were taught diaphragmatic breathing to correct their breathing pattern. Subjects then instructed to inhale to normal depth through nose and breath out against resistance for as long comfortable, maintaining diaphragmatic breathing pattern. At the start of study breathing exercise was done using Device for Pulmonary Physiotherapy (DPP) for duration of 15 minute from day two to end week two. The duration of use of Device for Pulmonary Physiotherapy (DPP) was increased from 15 to 30 minutes each day from end of week two to end of week four. Exercises of two sessions of 15 minutes each was done under supervision of therapist. The duration of use of DPP was progressed to 60 min each day with 3 sessions of 20 minutes each, under supervision of therapist, from end week four to end week six. The duration of breathing with DPP progressed to 90 minutes. From end week six to end week eight, subjects used the DPP with 4 sessions of 20 min each, out of which 3 sessions were under supervision of therapist, and the subject at home did 1 session. The minimum resistance at start of the study for each subject was three subjected to tolerance of the participant and was further progressed accordingly. At the end of week eight and at the end of 20 weeks, the baseline assessment was repeated.



Usage of Device for Pulmonary Physiotherapy (Smart Breathe) by elders. Outcome measure of effect of DPP was done by five categories of the component Body Functions from the ICF Geriatric Core Set<sup>(25)</sup>. We used the first qualifiers, which describe the extent of a problem in functioning – more precisely, it denotes the range from full functioning '0' (no problem) to complete disability '4' (complete problem). If a category was

not specified it was coded with '8' and if a category was inapplicable then it was coded with '9'. Because the properties of all qualifiers are not sufficiently evaluated, we used, similar to Grill et al, a simplified qualifier: each category of the components Body Functions and was graded with the qualifiers '0' for 'no impairment / restriction' and '1' for 'impairment / restriction'. The response option '9' was set to '0', because an inapplicable ICF category cannot be a problem and the qualifier '8' was set to missing. Five categories from body function and three categories from the component activity and participation were selected as shown in Table 1.

Table 1. ICF code and description

Item code	Description
b440	Respiration functions
b445	Respiratory muscle functions
b450	Additional respiratory functions
b455	Exercise tolerance functions
b460	Sensations associated with cardiovascular and respiratory functions
d455	Moving around
d460	Moving around in different locations
d910	Community life

## RESULTS

The data was analyzed using Microsoft excel-07 and SPSS-17. Out of 37 subjects, 68% fall in to age group 60-69 and 32%, subjects were from age group 60-69 years. 70% of the subjects were male and 30% were female. 86% subjects were married and 14% widowed. 43% of the participants had completed 11-15 years of the education, 35% subjects completed 6-10 years of formal education and 8% were illiterate. 65% of the subjects were retired and 5% were self-employed.

Table. 2: Demographic Profile

SUBJECT DEMOGRAPHICS:		
Characteristics	Number	%
<b>Age groups</b>		
60-69	25	67.57
70-79	12	32.43
<b>Sex</b>		
Male	26	70.27
Female	11	29.73
<b>Marital status</b>		
Married	32	86.49
Unmarried	0	0
Widowed	5	13.51
<b>Education (in years)</b>		
0	3	8.11
1-5	4	10.81
6-10	13	35.14
11-15	16	43.24
16-20	1	2.70

<b>Employment status</b>		
Self employed	2	5.40
House wife	11	29.72
Retired	24	64.86
<b>Prevalence of disease</b>		
Hypertension	16	43.24
Diabetes	15	40.54
Asthma	7	18.91
Hospitalization in past 1 year	8	21.62

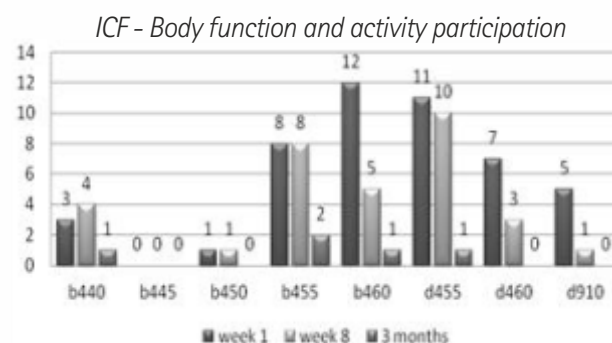
43% of the participants reported to have hypertension, 41% reported diabetes, 19% asthma and 22% of the participants reported history of hospitalization in last one year. 35% subjects were taking medication for hypertension, 24% were taking anti diabetic medications, 11% were using medicines for asthma and 8% were taking painkillers. 8% subjects gave history of alcohol intake and 11% of participants reported smoking. 89% of all the participants were using spectacles and 5% reported use of hearing aid.

Table. 3: Item codes from ICF Geriatric Core Set

ICF	N	disability count		Healthy %
		count	%	
ICFb440 (1st week)	30	3	10	90
ICFb440 (8th week)	30	4	13.3	86.7
ICFb440 (20th week)	30	1	3.3	96.7
ICFb445 (1st week)	30	0	0	100
ICFb445 (8th week)	30	0	0	100
ICFb445 (20th week)	30	0	0	100
ICFb450 (1st week)	30	1	3.333	96.666
ICFb450 (8th week)	30	1	3.333	96.666
ICFb450 (20th week)	30	0	0	100
ICFb455 (1st week)	30	8	26.666	73.333
ICFb455 (8th week)	30	8	26.666	73.333
ICFb455 (20th week)	30	2	6.6666	93.333
ICFb460 (1st week)	30	12	40	60
ICFb460 (8th week)	30	5	16.666	83.333
ICFb460 (20th week)	30	1	3.333	96.666
ICFd455 (1st week)	30	11	36.666	63.333
ICFd455 (8th week)	30	10	33.333	66.666
ICFd455 (20th week)	30	1	3.333	96.666
ICFd460(1st week)	30	7	23.333	76.666
ICFd460 (8th week)	30	3	10	90
ICFd460 (20th week)	30	0	0	100
ICFd910 (1st week)	30	5	16.666	83.333
ICFd910 (8th week)	30	1	3.333	96.666
ICFd910 (20th week)	30	0	0	100

Paired t-test was used for comparing the components of ICF. Paired t-test was applied between 1st week to 8th week and 1st week to 20th week.

Graph. 1: Disability count in body function & activity participation



The study group reported there was no significant difference in respiratory functions between visit 1 and at 8th week but significant improvement between visit 1 and at 20th week ( $p > 0.001$  at 95% CI). No changes were reported in additional respiratory function and exercise tolerance function as there was no/minimum disability counted. Statistically significant difference was reported in sensations associated with cardiovascular and respiratory functions between visit 1 and 8th week ( $p$  value 0.002 at 95% confidence interval) and between week 1 and week 20th. There was statistically significant difference in moving around function between visit 1 and at 20th week. No statistically significant difference was noticed in the domain of moving around in different locations.

There was statistically significant difference in community life between visit 1 and at 8th week ( $p$  value 0.02 at 95% confidence interval) (Table 4. Paired t-test of ICF component).

## DISCUSSION

The study illustrates significant improvement in sensations associated with cardiovascular and respiratory functions that includes sensations of tightness of chest, feelings of irregular beat, dyspnoea, air hunger, choking, gagging and wheezing<sup>[14]</sup>. It was noticed that mobility status, and community life of elderly also showed significant improvement.

Earlier studies have shown that respiratory muscle strength training may prevent a certain degree of muscle wasting<sup>[15,16,17,18]</sup>; Improvement in respiratory muscle strength reduces the competition for blood flow between the respiratory system and peripheral body segments<sup>[20,21,22,23]</sup>. It restores balance between respiratory system and peripheral body segments, and reduces the oxygen cost of respiration. Thus, there is a reduction in the requirement of motor-unit recruitment for respiratory muscles, which affect the intensity of dyspnoea<sup>[25]</sup>. This further improves participation in activities of daily living. This could be partially explained with Campbell's length-tension inappropriateness paradigm (1966).

In a study done by Watsford ET. AL (2008), elderly female subjects who underwent inspiratory and expiratory muscle strengthening training obtained significant improvement in respiratory functions. Elderly reported an improved ability of climbing stairs reduced fatigue while walking briskly uphill and improved quality of life and life satisfaction among the elderly participants<sup>[25]</sup>.

Another study conducted by Matsumoto ET. AL (2011), designed to clarify the effects of breathing with prolonged expiration on cardiopulmonary responses and autonomic nervous system activity during incremental exercise, resulted in improvement in ventilation efficiency, the suppression of sympathetic nervous system activity, and the activation of parasympathetic activity. Moreover, prolonged expiration breathing may have suppressed the exercise – induced increase in myocardial oxygen uptake<sup>[23]</sup> thus, improving the sensation of dyspnoea during exercises.

In our study, we have devised a respiratory muscle-strengthening program using a simple Device for Pulmonary Physiotherapy (DPP). DPP reinforces expiratory muscle strength training by incorporating a pressure threshold valve. Performing diaphragmatic breathing during the training helped subjects to correct their breathing pattern. Improvement in feeling of dyspnoea during various indoor and outdoor activities, improved walking ability in different locations and different kind of surfaces and community life such as social gathering, visit to markets and temples etc.

This respiratory muscle training helps in reduction in dyspnoea and improvement in cardio-vascular and respiratory function. This further leads to improved mobility and participation in activity living that facilitates increase participation in community life and reduction in social isolation. The Improved social gathering thereby helps in healthy ageing.

S.F. HO ET AL (2001) supported our study that dyspnoea had significant negative effects on going out socially, managing the garden and driving the car<sup>[26]</sup>.

The limitation of current study was small sample size hence results of this study cannot be generalized. There were 5 drops outs from the study due to various reasons like difficulty in using the device thereby causing headache, personal health issues and problem at home. Simple Technology like the Device for Pulmonary Physiotherapy (DPP) may help elders to develop physical and emotional wellbeing. Innovative technologies which involve elder participation can be a future study to promote participation of elders in community.

## CONCLUSION

The Device for Pulmonary Physiotherapy (DPP) helped elders to improve sensations associated with cardiovascular and respiratory functions, mobility social life. The study showed improved mobility of subjects around their house and community participation.

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Table. 4: Paired t-test of ICF component

	Paired Differences				P- value		t	
	Mean	Std. Deviation	(-) 95% CI	(+) 95% CI	Correlation	Sig.		
ICFb440 (1 wk – 8wk)	-.03333	.41384	-.18786	.12120	.196	.299	-.441	.662
ICFb440 (8wk –20wk)	.10000	.30513	-.01394	.21394	.473	.008	1.795	.083
ICFb440 (1wk – 20wk)	.06667	.25371	-.02807	.16140	.557	.001	1.439	.161
ICFb450 (1 wk – 8wk)	.00000	.26261	-.09806	.09806	-.034	.856	.000	1.000
ICFb450 (8wk –20wk)	.03333	.18257	-.03484	.10151	.	.	1.000	.326
ICFb450 (1wk – 20wk)	.03333	.18257	-.03484	.10151	.	.	1.000	.326
ICFb455 (1 wk – 8wk)	.00000	.45486	-.16985	.16985	.489	.006	.000	1.000
ICFb455 (8wk –20wk)	.20000	.48423	.01918	.38082	.141	.457	2.262	.031
ICFb455 (1wk – 20wk)	.20000	.48423	.01918	.38082	.141	.457	2.262	.031
ICFb460 (1 wk – 8wk)	.23333	.43018	.07270	.39397	.548	.002	2.971	.006
ICFb460 (8wk –20wk)	.16667	.53067	-.03149	.36482	-.346	.0611	1.720	.096
ICFb460 (1wk – 20wk)	.40000	.56324	.18968	.61032	.000	.000	3.890	.001
ICFd455 (1 wk – 8wk)	.03333	.61495	-.19629	.26296	.196	.300	.297	.769
ICFd455 (8wk –20wk)	.30000	.53498	.10023	.49977	-.131	.489	3.071	.005
ICFd455 (1wk – 20wk)	.33333	.47946	.15430	.51237	.244	.194	3.808	.001
ICFd460 (1 wk – 8wk)	.20000	.61026	-.02787	.42787	-.045	.813	1.795	.083
ICFd460 (8wk –20wk)	.03333	.41384	-.12120	.18786	.	.	.441	.662
ICFd460 (1wk – 20wk)	.23333	.43018	.07270	.39397	.	.	2.971	.006
ICFd910 (1 wk – 8wk)	.13333	.34575	.00423	.26244	.415	.023	2.112	.043
ICFd910 (8wk –20wk)	.03333	.18257	-.03484	.10151	.	.	1.000	.326
ICFd910 (1wk – 20wk)	.16667	.37905	.02513	.30821	.	.	2.408	.023

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# Funny Bone



