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## REHAB CHALLENGES

A 50-year-old male patient presented with right elbow pain for last two years. He was also suffering from poorly controlled diabetes and hypertension. Permanent pace-maker implantation was also done 10 years back due to complete heart block. On examination there was tenderness on lateral epicondyle with positive Cozen test. That's why he was advised to use TE band, analgesic and local superficial heat therapy. But the pain continues.

His x-ray of elbow was normal. USG of elbow ruled out any muscle tear. He didn't give consent for local steroid injection due to his diabetes. Please opine regarding further intervention plans for this patient.

# Medical Philately


**USA - CIRCA 1969**

A stamp printed in USA shows Cured Child,

Hope for Crippled Issue, Issued to encourage the rehabilitation of crippled children and adults, and to honor the National Society for Crippled Children and Adults (Easter Seal Society) on its 50th anniversary, circa 1969

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Original Article

# A Comparative Study of Efficacy of Ultrasound-guided Intra-articular Steroid Injection through Glenohumeral versus Subacromial Approach in the Treatment of Adhesive Capsulitis

*Ghorai D[1], Pramanik R[2], Palit AK[3], Haldar RN[4], Sarkar NR[5], Das PP[6]*


## Abstract

**Objective:** To compare the efficacy between glenohumeral and subacromial approach of intra-articular steroid injection under ultrasound guidance in the management of adhesive capsulitis.

**Study Design:** Randomised controlled parallel group open level study.

**Study Duration:** 18 months (January 2012 to June 2013)

**Study Setting:** Department of Physical Medicine and Rehabilitation, IPGMER, SSKM Hospital, Kolkata.

**Participants:** Patients having stage1 or stage2 adhesive capsulitis of shoulder (n=56) attending PMR OPD, IPGMER, SSKM Hospital, Kolkata during the study period.

**Intervention:** After randomisation 56 patients were allocated in two groups (glenohumeral and subacromial) consisting 28 patients in each group. Glenohumeral and subacromial group received intra-articular injection of 40mg methylprednisolone acetate with 2ml of lignocaine 2% through glenohumeral and subacromial approach respectively under ultrasound guidance along with physical therapy. Outcome measure was range of motion measured by goniometry.

**Results:** At 3 weeks post-injection glenohumeral group showed statistically significant improvement in passive flexion, active and passive abduction. At 6 weeks there was improvement in active and passive flexion in glenohumeral group but not in abduction . There was no difference in improvement of external rotation in any visit.


*Key words:* **Ultrasound-guided injection, approach, adhesive capsulitis.**

## Introduction:

Adhesive capsulitis is one of the most common causes of pain and stiffness of shoulder. Primary adhesive capsulitis of shoulder is an idiopathic, progressive, self-limiting restriction of active and passive range of motion[1]. Its pathogenesis is not fully understood till now. Probably it is the end result of many different pathological conditions of shoulder[2]. Adhesive capsulitis is 2 to 4 times more common in female than male and is most commonly seen in individuals between 40 and 60 years of age[3]. It is common in non-dominant shoulder and in 34% cases this condition is bilateral[4]. It is well known to be a self limiting condition[5]. Non-surgical intervention appears to be the initial treatment of choice for adhesive capsulitis[6]. Management of adhesive capsulitis includes local ice compression, application of moist heat, activity modification, shoulder mobilisation exercises, physical modalities (UST, TENS, iontophoresis, etc.), NSAIDs, intra-articular injection of steroid or combined steroid and lignocaine, suprascapular nerve block, acupuncture[7-9]. But the use of NSAIDs does not appear to offer any great advantage[10]. Systemic steroids also do not offer any long term benefit[10]. Surgical treatment options are considered

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when there is functional limitation with no improvement after 1 year of conservative treatment which include closed manipulation under general anaesthesia, over distension of joint by injecting a large volume (50 - 200ml) of sterile saline under pressure, therapeutic arthrography, arthroscopic release[11-13].

Local injection of glucocorticoids or combined intra-articular injection of corticosteroid and local anaesthetic into the shoulder joint provides symptomatic relief, improves tolerance to physical therapy and also limits the development of fibrosis, thus shortens the natural history of the disease in adhesive capsulitis[14-17]. Pre-adhesive stage (stages 1 and 2) adhesive capsulitis patients typically respond well to an intra-articular steroid injection, given the inflammatory nature of the disease[2,3,13,18]. But there is no indication for intra-articular corticosteroid injection in stage 3 and stage 4 of adhesive capsulitis as these are not inflammatory stage[15]. Intra-articular steroid injection in shoulder joint can be given under ultrasound guidance or even without any radiological guidance. But ultrasound guided injection provides better outcome than blind technique[19,20].

There are different techniques of infiltration of steroid into the shoulder joint. Both the glenohumeral or subacromial approach can be effective[21-25]. But there are scarcity of literature about the comparative efficacy of those two different approaches. This project is a humble attempt to find out which approach of intra-articular steroid injection (glenohumeral or subacromial) is more efficacious in adhesive capsulitis.

## Aims and Objectives:

To compare the efficacy between ultrasound-guided glenohumeral versus ultrasound-guided subacromial approach of intra-articular steroid injection in the management of adhesive capsulitis.

## Materials and Methods:

Before starting the study approval was taken from institutional ethics committee, IPGMEandR, SSKM Hospital, Kolkata. Informed written consent was taken from each patient before including them in this study. Every patient was explained about the disease, its present available management, the outcome and complications in a language that was understandable to them. All participants were informed that they can withdraw themselves from the study whenever they want.

**Study area:** Department of Physical Medicine and Rehabilitation, IPGMER and SSKM Hospital, Kolkata.

**Study population:** Patients with adhesive capsulitis attending the OPD of the department of Physical Medicine and Rehabilitation at IPGMER and SSKM Hospital, Kolkata.

**Study period:** 18 months.

**Sample size:** n=56 (28 in each group).

For the purpose of sample size calculation the range of motion of individual movement in shoulder joint was taken as primary outcome measure. Earlier studies suggest that a difference of 5 degree of range of motion may be detected and the standard deviation for this parameter were in the range of 3 to 7 degree[26]. We estimated that 22 subjects would be required in each group in order to detect 5 degree difference in range of motion with 90% power and 5% probability of type 1 error, assuming standard deviation to be 5 degree. Assuming 20% drop out rate this translates a recruitment target of 28 patients/group. Since there was two groups, our overall recruitment target was 56 subjects. Randomisation was done with subjects stratified by injection site.

**Study design:** This study was a randomised controlled parallel group open level study.

INCLUSION CRITERIA:

1) Patients with unilateral stage 1 and stage 2 adhesive capsulitis.
2) Age between 18 years to 65 years

EXCLUSION CRITERIA:

1) Patients with stages 3 and 4 adhesive capsulitis.
2) Age less than 18 years or more than 65 years.
3) Patients with rotator cuff tear.
4) Patients with diabetes, hypothyroidism, rheumatoid arthritis or other inflammatory arthritis, post myocardial infarction, post stroke, post mastectomy, prolonged immobilisation.
5) Overlying soft tissue infection, infection in the joint, uncontrolled bleeding diathesis, presence of a joint prosthesis.
6) Patients who got intra-articular injection in shoulder within last one year.
7) Adhesive capsulitis secondary to brachial plexopathy or other peripheral nerve injury.
8) Adhesive capsulitis with recent bony injury or malignancy around that shoulder.
9) Patients with bilateral adhesive capsulitis.

**Parameters studied:** Active and passive range of motion (flexion, abduction, internal rotation and external rotation) of affected shoulder by goniometry.

**Assessment:** At 0 week, 3 weeks, 6 weeks.

**Study Tools:**

- Disposable syringe and needles.
- Sterile gloves.
- Povidone iodine.
- Chlorhexidine.
- Inj depot methylprednisolone acetate.
- Lignocaine 2%.
- Band aid.
- Sponge holding forceps.
- Gauze piece.
- Goniometer.
- Sphygmomanometer.
- Stethoscope.
- Ultrasonography machine (Philips HD-7).
- Linear probe, etc.

## Study Technique:

In this study patients suffering from adhesive capsulitis were selected for intervention according to the inclusion and exclusion criteria. Routine blood examination, fasting blood sugar and TSH were measured. X-ray and USG of affected shoulder were done prior to giving injection. Before doing the intervention selected patients were examined regarding their body weight, vitals, shoulder range of motion (ROM) and were enquired about the pain severity in VAS scale (0 to 10) on the day of injection (visit-1/V1). Physician's global assessment and patient's global assessment were also measured at the visit-1.

The selected patients were divided into two groups randomly. Every patient was given intra-articular injection under ultrasound guidance (Figs 1-3) with 1ml of depot methylprednisolone acetate (40mg) and 1ml of 2% lignocaine under strict aseptic condition. One group was given through glenohumeral approach and second group was given through subacromial approach in the shoulder joint.

In USG-guided glenohumeral approach (Fig 4) of injection patient was sitted comfortably on a stool, antiseptic dressing was done. The glenohumeral joint space was located by USG. The needle was introduced 1 cm below and lateral to the coracoid process and advanced into the glenohumeral joint space. Direction of needle was horizontal and little lateral to avoid injury to axillary nerve. Before injecting aspiration was done to check for any vessel puncture. In USG-guided subacromial approach (Fig 5) of injection maintaining strict asepsis the subacromial space was located with the help of USG.The needle was introduced 1 cm below the acromian angle and the rest of the procedure was same.

Both groups received education regarding life style modification, shoulder mobilisation exercises (Codman's exercises, pulley exercises, wall climbing exercises, cross body reach, overhead stretching, etc.) for 2 to 3 sittings daily with 10 to 15 times of repetition/sitting and 5 days course of aceclofenac (100mg) twice daily, pantoprazole (40mg) once daily, oral antibiotic (amoxicillin/cefixime). No patient had any contraindication for any of those drugs.

After administering injections, the patients were examined and assessed at the interval of 3 weeks (visit-2) and 6 weeks (visit-3). Shoulder range of motion (active and passive) was assessed with goniometer. Shoulder flexion, abduction, external and internal rotation were measured on both follow-up visits. Pain severity was again assessed according to VAS scale and physician's global assessment and patient's global assessment. Using the parameters mentioned above the results were analysed according to the standard statistical methods. Data had been summarised by descriptive statistics, that is mean and standard deviation for numerical variables and counts and percentages for categorical variables. Numerical variables had been compared between groups by student's independent sample t- test where normally

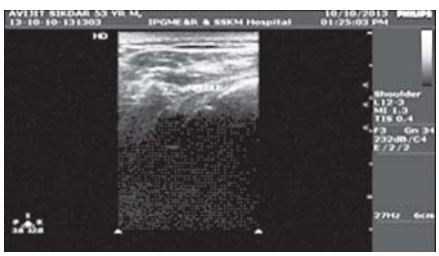

**Fig 1:** *Steroid Injected in Subacromial Space*

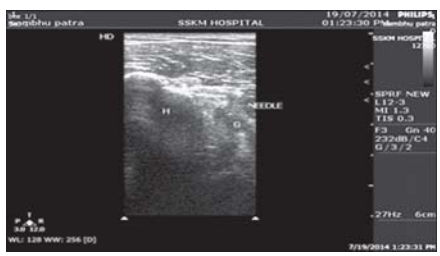

**Fig 2:** *Steroid Injected in Glenohumeral Joint*

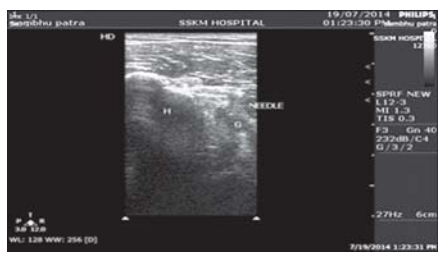

**Fig 3:** *Fluid in Bicipital Groove*

distributed and by Maan-Whitney U test where not normally distributed followed by Dunn's test. Chi-square test/Fisher's exact test has been employed for comparison of independent proportion. All analyses were 2-tailed and $p<0.05$ has been considered as statistically significant.

## Result Analysis:

In this study, 51 out of 56 patients completed follow-up. Glenohumeral (GH) injection group included 25 patients and subacromial (SA) injection group included 26 patients. Majority of the patients (47 out of total 51 patients) were within the age group of 40 to 60 years (Table 1). In total study population 64.70% were male and 35.30% were female (Fig 6), 60.78% patients had left shoulder and 39.22% had right shoulder involvement (Fig 7), 48.04% patients were having stage1 and 51.96% were having stage2 adhesive capsulitis (Fig 8).

**Comparison of Parameters between Groups**

At visit-1 there was no statistically significant difference between those two groups in any parameters (Table 2).

At 3 weeks post-injection glenohumeral group showed statistically significant improvement in passive flexion, active and passive abduction as compared to subacromial group (Table 3).

At 6 weeks post-injection there was no difference in improvement of abduction between those groups. But improvement in active and passive flexion were better in glenohumeral group (Table 4). There was no difference in improvement of external rotation in any visit.

**Drop Out:** In this study only 5 patients out of 56 failed to follow-up. In glenohumeral group 3 patients and in Subacromial group 2 patients did not complete the follow-up. So, the total drop out rate was 8.93%.

## Discussion:

The effectiveness of intra-articular injection of steroid in adhesive capsulitis has been claimed for long. Injection can be given through different approach[27]. There are few studies comparing the effectiveness of glenohumeral versus subacromial approach of injection.

This study showed that age is an important risk factor for the occurrence of adhesive capsulitis as the highest number of the patients in this total study population were between the age group of 40 and 60 years. As per several literatures incidence of adhesive capsulitis is highest between 40 and 60 years of age group[3,11,13].

Adhesive capsulitis is more common in women[6,28]. But, in this study 64.70% of the total study population were male and 35.30% were female. This is probably due to relatively small study population.

All the patients in this study were right handed; 60.78% patients of the total study population had left shoulder involvement and 39.22% had right shoulder involvement. This finding is also supported by some literatures as saying that non-dominant shoulder involvement is more common in adhesive capsulitis[4].

More patients (51.96%) of the total study population were in stage 2 and 48.04% patients were in stage 1 of adhesive capsulitis. Stage 3 and stage 4 adhesive capsulitis were excluded from this study, as these are not inflammatory stage[15].

During comparison between glenohumeral versus subacromial, in glenohumeral group there was statistically significant improvement in passive flexion at visit-2 and in active as well as passive flexion in visit-3. For abduction, though statistically significant improvement was found in active and passive abduction

**Table 1:** *Descriptive Statistics for Age in Years (GH= Glenohumeral, SA = Subacromial)*

| Group | Minimum | Maximum | Mean | Standard deviation |
|---|---|---|---|---|
| GH (n = 25) | 45 | 64 | 51.5 | 4.48 |
| SA (n = 26) | 40 | 64 | 53.2 | 6.39 |

**Table 2:** *Comparison of Parameters between Groups at Visit-1*

| Variables | Glenohumeral (Mean±SD) | Subacromial (Mean±SD) | p-value |
|---|---|---|---|
| Active flexion | 86.0±17.97 | 85.0±22.67 | 0.862 |
| Passive flexion | 92.0±16.52 | 88.5±21.34 | 0.512 |
| Active abduction | 74.4±25.14 | 71.2±21.74 | 0.624 |
| Passive abduction | 81.0±21.41 | 73.1±21.59 | 0.194 |
| Active external rotation | 25.6±4.64 | 26.7±8.83 | 0.572 |
| Passive external rotation | 30.8±6.07 | 30.0±8.94 | 0.711 |

in glenohumeral group at visit-2, no significant difference was found between them at visit-3. For external rotation and internal rotation, there was no significant difference in improvement at visit-2 and visit-3 between those groups.

However the persistence of the improvement over long term could not be determined as the final follow-up was at 6 weeks. So, better designed and better planned studies could be done to find out those in future. Only one patient complained of mild local pain during administration of

**Table 3:** *Comparison of Parameters between Groups at Visit-2 (3 Weeks Post-injection)*

| Variables | Glenohumeral (Mean±SD) | Subacromial (Mean±SD) | p-value |
|---|---|---|---|
| Active flexion | 138.8±18.72 | 130.0±13.27 | 0.058 |
| Passive flexion | 146.8±19.09 | 137.7±10.88 | 0.041 |
| Active abduction | 123.2±23.93 | 109.2±21.85 | 0.034 |
| Passive abduction | 131.2±24.12 | 116.5±21.90 | 0.027 |
| Active external rotation | 46.8±5.38 | 47.1±4.73 | 0.825 |
| Passive external rotation | 53.6±6.85 | 51.9±4.71 | 0.312 |

**Table 4:** *Comparison of Parameters between Groups at Visit-3 (6 Weeks Post-injection)*

| Variables | Glenohumeral (Mean±SD) | Subacromial (Mean±SD) | p-value |
|---|---|---|---|
| Active flexion | 165.2±9.41 | 158.5±8.81 | 0.011 |
| Passive flexion | 173.6±8.10 | 168.5±8.81 | 0.035 |
| Active abduction | 156.8±11.80 | 153.7±8.43 | 0.277 |
| Passive abduction | 165.6±10.83 | 163.1±8.26 | 0.353 |
| Active external rotation | 69.6±5.94 | 68.1±6.64 | 0.393 |
| Passive external rotation | 78.8±7.11 | 77.5±6.20 | 0.489 |

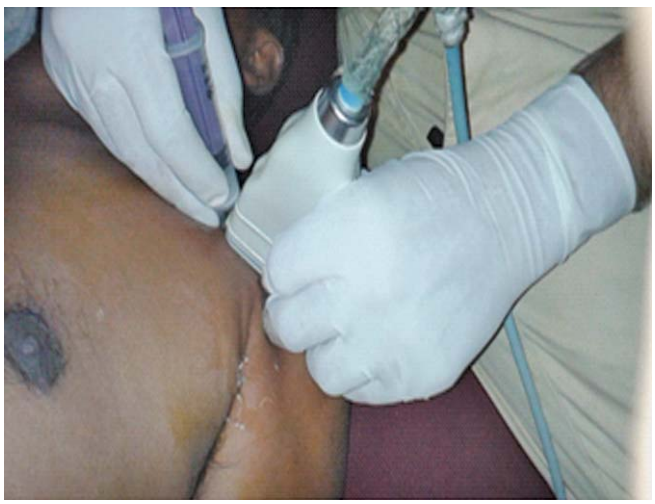

**Fig 4:** *Glenohumeral Injection - USG Guided*

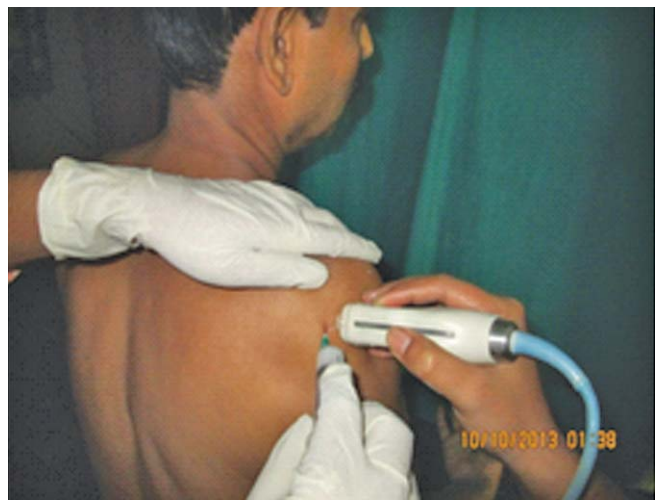

**Fig 5:** *Subacromial Injection - USG Guided*

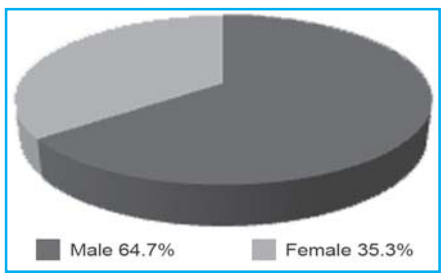


**Fig 6-** *Sex Distribution in Total Study Population*

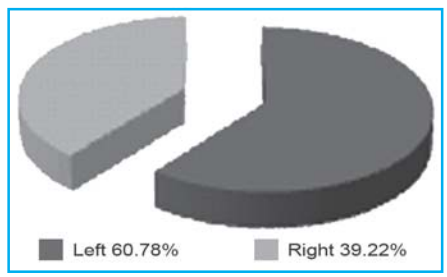


**Fig 7-** *Distribution of Side of Involvement in Total Study Population*

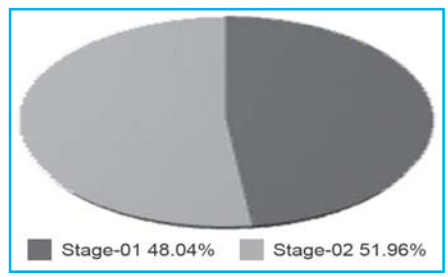


**Fig 8-** *Distribution of Stage of Disease in Total Study Population*

steroid in the shoulder joint and that was transient. No other adverse reaction occurred in any group of patients, which suggests that all the treatment options are safe if not otherwise contra-indicated.

## Conclusion:

Ultrasound guided injections in adhesive capsulitis by glenohumeral approach is better than subacromial approach in terms of short term improvement and morbidity.

**Limitations:** There were some limitations of this study. The limitations were :

1) No control group was taken.
2) Sample size was small in each group.
3) It was a short term study as the final follow-up was at 6 weeks, so it was not possible to know the treatment effects after 6 weeks post-injection.

Initial post-injection frequent follow-up and statistical analysis were not done. So this study has a limitation to conclude about the immediate post-injection effect.

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# Editorial

## Manned and Virtual Ways to Provide Health Care to Persons with Disabilities in Rural India

**Training grassroot level workers**

**The Challenge:** The size of our population with disabilities (5-10% of 1.25 billion people) and the enormous diversity of context, language, culture and food make the provision of rehab services in our country challenging. In addition, the poverty and the lack of opportunity for much of our rural population (i.e. 70% of our people) makes poverty one of the most severe and insidious disabilities which needs to be addressed if poor people are to have a say in their destiny.

**The solution:** Over the year, different solutions have been used: Formal and non-formal training, paid workers and volunteers, centralised and decentralised supervision, innovative new solutions and upscaling existing solutions. In CMC Vellore, Dr Ida Scudder reached out to the people in the rural areas through "Road Side Clinics" and camps. Dr Paul Brand addressed difficulty in finding people to work with leprosy patients by training leprosy cured persons as Hand and Leprosy Physio Technicians. The need to involve the family in the treatment of persons with mental illness resulted in programmes for training the mothers of mentally challenged children to become their prime therapist. Part Time Community Health Workers trained in MCH work were later trained in early diagnosis and interventions for PWD. Full time CBR volunteers were used in an urban slum setting to become our resource for rehabilitation in PWD in the community. Dr P K Shetty pioneered the use of local craftsmen to make the famous Jaipur foot prosthesis. More than 1.3 million persons have been fitted with Jaipur foot since then. Mr Sanjit "Bunker" Roy started a barefoot college in Tilonia where he trained village grandmothers to become hand pump mechanics, solar engineers, F.M Operators and fabricators and masons. He said "literacy is what you learn in school, education is what you acquire in life from family, traditions, culture, environment and personal experiences....so everyone is an educational resource". "Use the knowledge, skills and wisdom existing in villages for development before importing. Put sophisticated technology in the hands of poor so they are not exploited" The Arvind Eye Care System was started by the visionary Dr G Venkataswamy in Madurai in 1970s, who himself had rheumatoid arthritis and was appalled at the huge number of needless blinds in our country. He used the Mac Donalds business concept of combining mass production with unerring quality, by intensive training of village girls in specific tasks. Each task was broken down to its components and unnecessary parts omitted and essential ones optimised.

**The result:** World class treatment at Indian prices for millions of people at many centres in Tamil Nadu with complication rates less than those in the NHS of the UK. Training grassroot level workers is challenging because of the size and diversity of our land and the range of skills required for different disabilities. Some key features in the exemplary solutions are: a visionary who is able to see the problem; see local, available people and their skills as resources; are able to demystify and disseminate complex technology, and encourage innovation and lifelong learning.

**Tele-Rehabilitation**

Tele-rehab is the use of communication or information or information technology (IT) to assist in the diagnosis, prognosis, treatment and follow-up of persons with disabilities through the transmission of data between two different physical locations. Initially, telecommunication through telephone advice lines was particularly useful in Counselling and Psychiatry. The availability of Video link consultation brought in specialities like Dermatology and Ophthalmology. Improved data digitisation and transmission brought in the laboratories, Radiology and cardiology. Now there is no speciality that cannot improve its reach and effectiveness through IT. Telemedicine is known as tele care. The explosive growth of information and educational material on the internet and dramatic decrease in cost and increase ease of access is a boon for the education of PWD and their families enabling them to network and make more informed choices. Professionals in rural settings can keep up with recent developments and good evidence of the efficacy and cost benefit ratio of interventions. Online marketing has made many functional aids and devices available to persons in rural areas. There are disadvantages in Tele rehab: treatment and developments can become Technology driven rather than patient centered and patient led; a master, not a tool. Instead of enhancing best practice, technology can replace it and tele rehab that does not tie in with appropriate clinical services can cause harm. A little knowledge is a dangerous thing! Evidence of clinical effectiveness and ethical soundness are yet to be developed: It is new but is it better? Robust clinical, financial and legal governance is yet to be put in place: who is responsible?

**Instead of "Taking Rehabilitation Medicine to rural India". I hope that at end of the talk participants will be encouraged to "Discover rehabilitation Medicine in Rural India" and also "Discover rural India in Rehabilitation" and join with our poor, both rural and urban, to promote true independence and true choices.**

– Dr Suranjan Bhattacharya

# Methotrexate induced Pancytopenia in a Patient of Rheumatoid Arthritis: A Case Report

*Romi Singh Nongmaithem[1], C Zonunsanga[2], Hmingthanmawii[3], Mingam Pertin[4], Jaichand Singh Laishram[5]*

## Introduction:

Methotrexate is the commonest disease modifying antirheumatic drug (DMARD) used in the treatment of rheumatoid arthritis (RA). It may be prescribed as monotherapy, or in combination with other DMARD or biological agents. In methotrexate treated RA patients, the prevalence of haematological toxicity, including leucopenia, thrombocytopenia, megaloblastic anæmia and pancytopenia is uncommon and is estimated to be less than 5%[1]. The extent of pancytopenia, a serious and unpredictable adverse effect of methotexate, may be underestimated. A case of RA patient presenting with methotrexate induced pancytopenia due to inadvertent dosing of the drug is reported here.

## Case Report:

A 70-year-old man diagnosed case of RA for 1 year who was on combination therapy of DMARDs viz. methotrexate (15mg/week with folic acid supplementation), salfasalazine (1gm twice daily) and hydroxychloroquine (200mg once daily) for 1 month. On routine follow-up methotrexate dose was raised to 20mg per week. He came back after 2 weeks with complaints of painful eruptive rashes all over the trunk (Fig 1), bleeding gum and melaena for 4 days. On further enquiry there was a history of daily intake of methotrexate 20 mg for 12 days continuous by mistake.

On examination, the patient looked weak, pale and there was active bleeding of gum and throat. Oral candidiasis was present, and the urine output was normal. There were multiple eruptive rashes present all over the trunk both anterior and posteriorly. Blood pressure was 110/70mm Hg with a pulse rate of 90/minute. Chest, cardiovascular, and abdominal examinations were normal clinically.

On investigation, Hb-9gm/dl, TLC-2300/ cumm, DLC N59L37M4E0, ESR 5mm/1st hour, platelets 12,000 / cumm (severe thrombocytopenia), RBC 2.91 million / cumm, MCV 91, RBC morphology-normocytic, normochromic. Liver function test and kidney function test were normal.

Bone marrow examination revealed reduced erythropoiesis with many megaloblasts, suppressed myelopoiesis with markedly suppressed megakaryopoiesis consistent with features of bone marrow suppression (Fig 2, Leishman, x1000).

All ongoing DMARDS were stopped immediately. The patient was given supportive treatment with IV fluid infusion and daily transfusion of platelet concentrate. Antibiotic coverage with systemic antifungal therapy was started and recombinant granulocyte colony stimulating factors (G-CSF) i.e filgrastim 300 µgm subcutaneous injection was given daily for 5 days. Oral hygiene was maintained with antiseptic mouthwash. Packed red blood cell supplement was given from third day of admission besides platelet concentrate because of reducing haemoglobin concentration by third day of admission (i.e. 6.8 gm/dl). Peripheral haematological examination became normal with improvement in general condition after 2 weeks of admission, and patient was kept on follow-up programme for treatment of RA.

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## Discussion:

Pancytopenia, a rare but potentially fatal complication of methotrexate therapy, may develop suddenly without any warning signs. It can occur early within 1–2 months of starting methotrexate, independently of dose and route of administration, this type of toxicity is called idiosyncratic. More commonly, however, it occurs late, suggesting a cumulative effect[2]. Risk factors for this cumulative toxicity include use of the drug in the setting of renal insufficiency, folic acid deficiency, acute infection such as parvo virus infection, dosing errors such as daily therapy, and concomitant use of selected drugs including probenecid and cotrimoxazole[1].

Methotrexate by its action as a folic acid antagonist, blocks the synthesis of purines and pyrimidines by inhibiting several key enzymes. The half-life of methotrexate in the serum is in the range of 6 to 8 hours after administration of the drug, and methotrexate is undetectable in the serum by 24 hours. Once taken-up by cells, methotrexate is metabolised to polyglutamate derivatives. Methotrexate polyglutamates (MTXglu) are stored in the tissues, including liver and erythrocytes, for long periods[3]. The estimated median half-life of MTXglu is around 3 weeks (range 2-4 weeks)[4].

The accumulation of MTXglu in the tissues viz liver, erythrocytes, etc reduces the polyglutamation of natural folates and may account for the chronic toxicity associated with methotrexate in patients of RA taking this drug[5].

Exposure to prolonged suprathreshold concentration of methotrexate is responsible for the toxic effect of this drug on tissues rather than achieving the peak level of the drug at one time. Lim *et al*,[6] in their review of 25 cases of methotrexate induced pancytopenia, observed that daily dosing of the drug had enhanced toxic affect than weekly dosing. In their case series, 1 patient had reportedly taken 2.5mg methotrexate daily for 6 days and 5mg on the 7th day of the week making a total intake of 20mg. The patient had been reported with enhanced toxicity. Kar and Ghosh[7] also reported a case of methotrexate induced pancytopenia in a patient of RA taking methotrexate 2.5mg daily unsupervised for ten weeks.

We have observed the enhanced toxicity of methotrexate by inadvertent daily intake of the drug in the present case, with the patient taking 20mg methotrexate daily for 2 weeks leading to accumulation of suprathreshold concentration of the drug in the tissues leading to stomatitis with bleeding gums and oropharyngeal mucositis with pancytopenia with possibility of mucositis in gastro-intestinal tract.

The management of methotrexate induced pancytopenia is in line of supportive treatment. Stopping of the drug, then supportive treatment with fluid rehydration, nutritional status improvement, blood and its components transfusion is important, along with antibiotic and antifungal coverage. Careful maintenance of skin hygiene, good dental care, and rectal hygiene is essential.

Folinic acid (leucovorin) should be given in a suspected methotrexate toxicity. It should be administered at a dose equal to methotrexate dose every 4 to 6 hours until there is no detectable serum level of methotrexate. But folinic acid is most effective when administered within 24 to 48 hours after the last dose of methotrexate[1]. After this folinic acid is ineffective to counteract methotrexate toxicity since cellular uptake of methotrexate is already finished.[3] For this reason our patient was not given leucovorine therapy as the patient reported to us with the drug toxicity due to daily inadvertent consumption of the drug.

Methotrexate being weak acid is poorly water soluble at low pH and may precipitate in the kidney during and after high dose bolus infusion. The subsequent nephrotoxicity decreases the elimination, and may increase the toxicity. For this reason, pre- and post infusion hydration and urinary alkalinisation are routinely used in case of high bolus dose methotrexate infusion to minimise renal toxicity from methotrexate precipitation in the kidney tubules[8]. But here in our case the toxicity was due to daily cumulative effect and so hydration and alkalinisation was not considered.

Recombinant growth factors like granulocyte colony stimulating factor (G-CSF) or granulocyte macrophage colony stimulating factor (GM-CSF), and recombinant erythropoietin (rhu EPO) have enabled more specific management with improved outcome in the pancytopenia treatment[9]. Recombinant human G-CSF, acts on hematopoietic cells to stimulate production, maturation and activation of neutrophils. These recombinant growth factors are usually used in treatment of leucopenia from different causes[10]. It is also reported to be effective in management of methotexate induced pancytopenia[11].

## Conclusion:

The hepatoxicity of methotrexate is well known and established. But the more fatal condition methotrexate

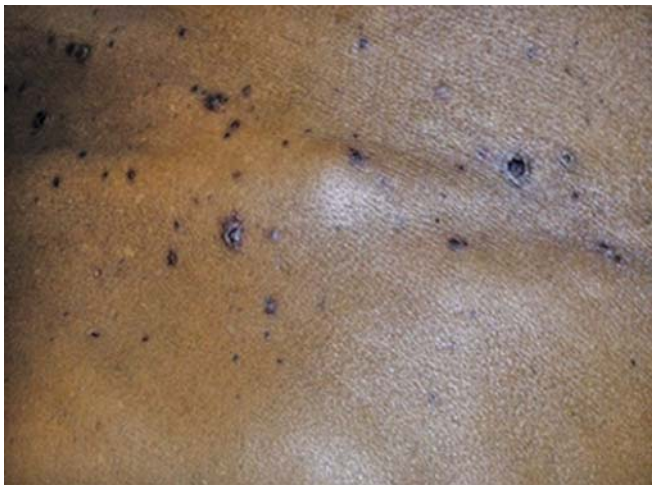

**Fig 1-** *Showing Petechial Skin Haemorrhage on the Trunk of Patient*

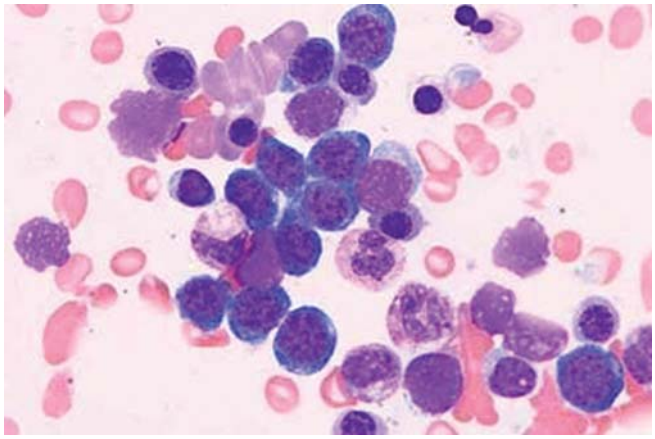

**Fig 2-** *Showing Decreased Cellularity with Features of Megaloblastoid Erythropoiesis, Suppressed Myelopoiesis Consistent with MTX induced Bone Marrow Suppression*

induced pancytopenia might be more common than expected and is probably under-reported. The methotrexate induced pancytopenia following wrong daily dosing of the drug causing a cumulative effect can lead to serious complication including death. Vigilance is required to identify this and prompt supportive management is essential to avoid fatal complications. Proper counselling about dosing of the drug is important in patients taking the drug to avoid such complications. Supportive treatment with blood and its components, recombinant growth factors like G-CSF, GM-CSF and rhu EPO along with measures for prevention of infections are the mainstay of management for methotrexate induced pancytopenia.

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# Olecrenon Bursitis in Normo Uricemic Crystal Disease

*Pramanik R[1], Halder RN[2]*

A forty-six-year-old man presented with sudden onset painful swelling over left elbow for last 1 month. It responded poorly with rest, cold therapy, analgesic and trypsin, bromelain and rituside combination. Neither he suffered from any trauma nor did he suffer from any joint pain, morning stiffness, back pain, eye congestion, oral ulcer, and any bladder or bowel problem.

On examination there was a tender slightly erethematous swelling over left elbow consistent with olecranon bursitis. (Figs 1 & 2). There were no clinical tophi anywhere in his body. His Hb%, TC, Neutrophil, ESR, CRP, serum uric acid were 11.8, 10,800 72%, 46, nonreactive and 6.5 respectively. RF and HLA B27 were also negative. X ray of his left elbow was normal.

We aspirated the fluid and sent for routine study, crystal analysis, AFB and ADA. Interestingly the fluid showed uric acid crystal. We started him with etoricoxib (90mg), allopurinol (300 mg) and local infiltration of methylprednisolone 40 mg. He responded well with the regimen.

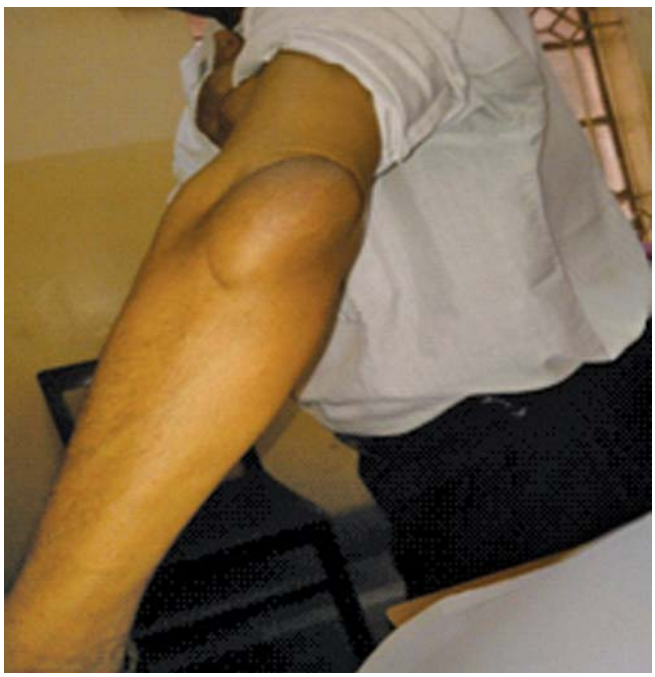

**Fig 1** *Erythematous Swelling on Left Elbow*

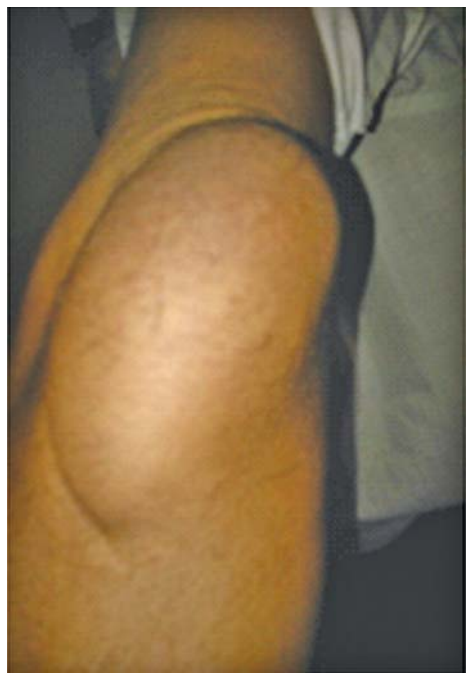

**Fig 2** *Erythematous Swelling on Left Elbow*

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Case Report

# Modified Orthoprosthesis with Ischial Containment Socket for a Deficient Limb: Case Report

*Ghosal Vasundhara[1], Neyaz Osama[2], Lenka P[3], Equebal Ameed[4], Jhalani R[5], Ballav Amber[6]*

## Abstract

**Introduction:** Congenital longitudinal deficiency of tibia is characterised by partial or complete absence of tibia with relative intact fibula. It is uncommon condition, occurring approximately 1 per 1 million births. Standard treatment is surgical intervention followed by prosthesis.

**Case presentation:** An 18 years old male with congenital type Ia tibial deficiciency (Jones classification based on radiographic evaluations) of right side presented with scoliosis with drooping of left shoulder and broken prosthesis. He was given modified through-knee prosthesis 3 years back as surgical intervention was refused. The altered biomechanics was identified. He has now been prescribed modified orthoprosthesis with ischial containment socket for uniform weight distribution and proper gait pattern.

**Conclusion:** Patient's gait pattern, based on centre of pressure, force distribution and gait parameters and $K_4b_2$ energy consumption was analysed with old and new prosthesis (immediately after and 6 weeks after gait training).The orthoprosthesis showed nearest to normal gait pattern and proved to be comfortable and energy efficient.

*Key words:* **Congenital type Ia tibial deficiency, modified orthoprosthesis, ischial containment socket, gait analysis, $K_4b_2$ energy expenditure analysis.**

## Introduction:

Tibial hemimelia was first described by Otto in 1941, also known as congenital longitudinal deficiency of the tibia.The incidence has been estimated at 1 in 1 million live births, and the condition actually may be bilateral in as many as 30% of patients[1]. It may be present as syndromes: polydactyly-triphalangeal thumb syndrome (Werner syndrome), tibial hemimelia diplopodia, tibial hemimelia-split hand/foot syndrome, and tibial hemimelia-micromelia-trigonal brachycephaly syndrome. The most widely used classification scheme for tibial hemimelia is that of Jones,Barnes and Lloyd-Roberts which is based on roentgenographic presentation[2].

In type 1a deformity, there is a complete radiographic absence of the tibia and a hypoplastic distal femoral epiphysis. In type 1b, there also is no radiographic evidence of a tibia but arthrography, ultrasound, and MRI, have shown tibial cartilaginous anlage. In type 3, in which the proximal tibia is not radiographically visible. The distal tibial epiphysis is sometimes visible, along with a mature distal metaphysis; in type 4, which is rare, the tibia is shortened, and there is a proximal migration of the fibula with distal tibial fibular diastasis .Also called as congenital diastasis of the ankle joint and congenital tibiofibular diastasis.

Treatment: The two options for treatment of type 1a deformities are knee disarticulation or knee reconstruction (with or without foot amputation)

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followed by prosthesis. Brown described reconstruction of type 1a tibial hemimelia[3,4] where fibula was surgically transferred into the intercondylar notch to create a tibia. Here we present a case of congenital type 1a tibial deficiency which was managed conservatively.

## Case Report:

A young male of 18 year with **deformity of right limb** (Fig 1) since birth presented to the OPD. He complained pain in right foot while walking and difficulty in sitting with the prosthesis which was given to him 3 years back and also recent breakage of the medial joint of the prosthesis.

On **physical examination** of the patient, he had average built. His right leg was short and deformed. There was presence of only one bone which was present laterally and the head was palpable and proximally displaced. The right knee was fixed in 90 degree flexion. Ankle was in fixed equinus with foot supinated and presence of 3 toes. ROM of right side revealed full range at hip, fixed ankle, AROM of knee – 90 to 140 degree and passively to 160 degree. MMT of the right side revealed power around the hip to be 4/5. Knee, ankle, foot could not be tested. He also had absence of right middle finger (Lobster hand) and drooping of left shoulder. No other abnormality was present. He was using a through knee prosthesis (Figs 2&3) since last 3 years for outdoor mobility and axillary crutches for indoor mobility. On **examination of the prosthesis,** it was 4 kg in weight. The socket was plug fit with almost circular socket brim. There was breakage of medial joint.

**X-ray right leg** (Fig 4) showed total absence of tibia, proximal migration of head of fibula, fusion of talus and calcaneus, four metatarsals and phalanges for 4 toes.

Based on Jones,Barnes and Lloyd-Roberts, he was diagnosed as **type Ia tibial deficiency**[2].

His old prosthesis was repaired and intial gait analysis data by CDG[5] and energy expenditure data by K4b2[6] was taken. He was prescribed orthoprosthesis with modified ischial containment socket with posterolateral opening, hollow shank (Figs 5 & 6). Silesian belt suspension, single axis knee joint and SACH foot was same as previous prosthesis. The new orthoprosthesis was lighter in weight (2.5 kg). Repeat gait and energy expenditure data (Figs 7-10) was taken immediately after new orthoprosthesis and after gait training of 6 weeks.

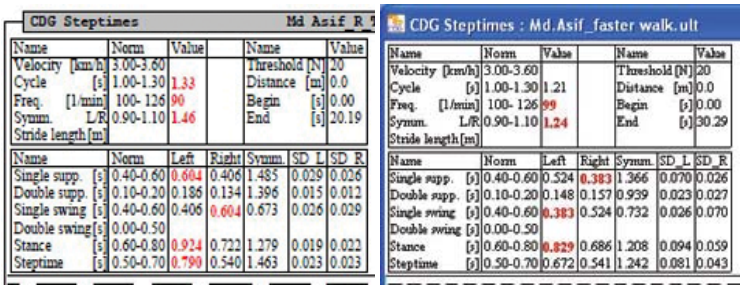
## Results:

Though pain in foot while walking or sitting was immediately relieved with the orthoprosthesis and there was improvement in both standing and sitting posture but immediate data of gait parameters and energy expenditure was worse than the old prosthesis that may be due to patient's old gait pattern. Gait training was given for 6 weeks and the new data showed improvement in gait parameters. Uniform distribution of COP. More energy efficient gait. Table 1 shows various parameters and comparison between old and new prosthesis.

## Discussion:

With the old prosthesis,(a) there was imbalance in weight transmission due to pain in deformed limb. The foot was present in the posterolateral portion of the socket, so weight line was falling medially while the vertical component of GRF acting vertically up, creating a couple at the knee joint. Also, during heel strike, there was presence of anticlockwise movement around the knee joint, to balance the shear component of GRF which was acting clockwise which created another couple at the mechanical knee joint. This could be reason of breakage in the joint. (b) The drooping of the shoulder could not be corrected by placing blocks under the prosthesis.


**Fig 1-** *Patient Sitting Showing Right Limb Deformity;* **Figs 2&3-** *Patient Standing Wearing Old Prosthesis with Accommodative Socket;* **Fig 4-** *An AP Radiograph of Right Leg Revealed Congenital Deficiency of Tibia and Foot Deformities;* **Figs 5&6-** *Patient Standing Wearing New Prosthesis with Ischial Containment Socket and Posterolateral Opening*



CDG Steptimes Md Asif_R_1

| Name | Norm | Value | | Name | Value |
|---|---|---|---|---|---|
| Velocity [km/h] | 3.00-3.60 | | | Threshold [N] | 20 |
| Cycle [s] | 1.00-1.30 | 1.33 | | Distance [m] | 0.0 |
| Freq. [1/min] | 100- 126 | 90 | | Begin [s] | 0.00 |
| Symm. L/R | 0.90-1.10 | 1.46 | | End [s] | 20.19 |
| Stride length [m] | | | | | |

| Name | Norm | Left | Right | Symm. | SD_L | SD_R |
|---|---|---|---|---|---|---|
| Single supp. [s] | 0.40-0.60 | 0.604 | 0.406 | 1.485 | 0.029 | 0.026 |
| Double supp. [s] | 0.10-0.20 | 0.186 | 0.134 | 1.396 | 0.015 | 0.012 |
| Single swing [s] | 0.40-0.60 | 0.406 | 0.604 | 0.673 | 0.026 | 0.029 |
| Double swing [s] | 0.00-0.50 | | | | | |
| Stance [s] | 0.60-0.80 | 0.924 | 0.722 | 1.279 | 0.019 | 0.022 |
| Steptime [s] | 0.50-0.70 | 0.790 | 0.540 | 1.463 | 0.023 | 0.023 |

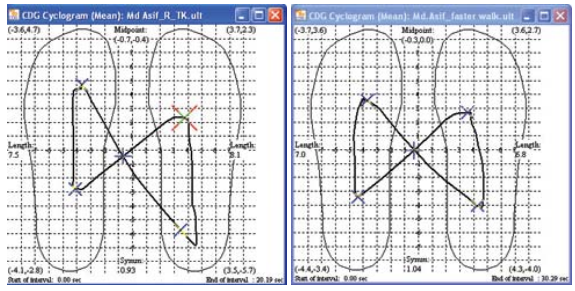


CDG Steptimes : Md.Asif_faster walk.ult

| Name | Norm | Value | | Name | Value |
|---|---|---|---|---|---|
| Velocity [km/h] | 3.00-3.60 | | | Threshold [N] | 20 |
| Cycle [s] | 1.00-1.30 | 1.21 | | Distance [m] | 0.0 |
| Freq. [1/min] | 100- 126 | 99 | | Begin [s] | 0.00 |
| Symm. L/R | 0.90-1.10 | 1.24 | | End [s] | 30.29 |
| Stride length [m] | | | | | |

| Name | Norm | Left | Right | Symm. | SD_L | SD_R |
|---|---|---|---|---|---|---|
| Single supp. [s] | 0.40-0.60 | 0.524 | 0.383 | 1.366 | 0.070 | 0.026 |
| Double supp. [s] | 0.10-0.20 | 0.148 | 0.157 | 0.939 | 0.023 | 0.027 |
| Single swing [s] | 0.40-0.60 | 0.383 | 0.524 | 0.732 | 0.026 | 0.070 |
| Double swing [s] | 0.00-0.50 | | | | | |
| Stance [s] | 0.60-0.80 | 0.829 | 0.686 | 1.208 | 0.094 | 0.059 |
| Steptime [s] | 0.50-0.70 | 0.672 | 0.541 | 1.242 | 0.081 | 0.043 |

**Figs 7&8-** *CDG (Computer Dynagraphy) Data with Old and New Prosthesis Respectively*



**Figs 9&10-** *COP (Centre of Pressure) Data with Old and New Prosthesis Respectively*

**Table 1:** *Shows Parameters of Old and New prosthesis*

| **Old prosthesis** | **New prosthesis** |
|---|---|
| Heart rate (beats/minute): 98 | Heart rate (beats/minute): 84 |
| Oxygen consumption (ml/minute: 930 | Oxygen consumption (ml/minute: 430 |
| Energy consumption (kcal/minute): 3.93 | Energy consumption (kcal/minute): 1.69 |

The new orthoprosthesis was designed based on principles of biomechanics. Weight bearing was through distal part of patella and ischial tuberosity .Rotational control of the ischial containment socket is provided by the proximomedial brim and its bony lock against the ischium, the shape and channels of the anterior wall, and the post-trochanteric contour of the lateral wall[7,8]. So proper weight transmission and rotational control was done to avoid the previous error of coupling.

## Take home message/Conclusion:

As per literature congenital tibial deficiency is ideally treated with appropriate surgical procedures followed by prosthesis. But in cases when surgery could not be done due to any reason, modified orthoprosthesis based on the principles of biomechanics may be considered.

## Conflict of Interest:

The authors have no conflict of interest to declare.

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Original Article

# Outcome Analysis of Upper Brachial Plexus Injury at Government Stanley Hospital

*Sampath Kumar S[1], Geetha Kalpana J[2], Krishnamoorthy R[3], Karthikeyan G[4]*


## Abstract

**Objective:** To analyse all the traumatic brachial plexus patients attending Physical Medicine and Hand Rehabilitation Department under Institute of Research Rehabilitation of Hand, Govt. Stanley Medical College and Hospital, Chennai. The demographic and outcome analysis are made.

**Methods:** Thirty-five patients were analysed their age, sex, level of injury, side of injury, mode of injury, occupation, postoperative cases assessment are made. Physiotherapy and orthosis given and followed.

Age—46% - 21 - 30 years; Sex—M:F - 31 : 04.

**Level of injury:** Pan palsy 40% C56 26% C567 31% C8T1 03%

**Side right is common:** 60%

**Mode of injury:** 77% road traffic accident

**Occupation:** Students: Manual labourer: Sedentary worker 10:12:13

**Associated injuries:** 42% in pan palsy; 55% in C567 level.

**Conclusion:** Productive age group of 21 to 30 years. Total brachial plexus, males and right side commonly are involved. Outcome analysis revealed moderately good results in surgical treatment of upper brachial plexus lesions. Management of the patient is difficult pre- and postoperatively.


*Key words:* **Brachial plexus injury, outcome analysis, demographic analysis.**

## Introduction:

The brachial plexus is formed by the anterior primary rami of the lower cervical (C5-8) and the first thoracic (T1) spinal nerve. In prefixed brachial plexus C4 provides significant contribution to C5, but T2 does not contribute. In post-fixed brachial plexus, T2 has significant contribution to T1 but C4 does not[1].

Prefixed and post-fixed contribute in about 3% of the cases[2]. The brachial plexus starts at the scalenes, courses under the clavicle, and ends at the axilla. It is typically composed of 5 roots, 3 trunks, 6 divisions (2 from each trunk), 3 cords and terminal branches. Each spinal nerve is formed by the adjoining of the ventral root (motor fibres) and dorsal root (sensory fibres). The dorsal root ganglia are formed within the inter-vertebral foramen, immediately outside the dura mater of the spinal cord. The dorsal and ventral roots unite a few millimeter distal to the dorsal root ganglion to form a mixed spinal nerve[3].

Brachial plexus injury may be caused by trauma (open or closed injury), compression, tumour, infection, inflammation, toxins and others. Millesi[4] classified brachial plexus injury into four levels.

1. Supraganglionic root (level I)
2. Infraganglionic root (level II)

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3. Trunk ( Supraclavicular) (level III )
4. Cord (infraclavicular) ( level IV).

Based on the surgeon's findings, adult patients may be diagnosed with any one of the following conditions like neurapraxia, neuroma, rupture and avulsion. Multiple root avulsion is the most common diagnosis in high-energy traumatic brachial plexus injuries, such occurs in a motorcycle or off-road vehicle accident[5].

**Aim of the study:**

I. To look for demographic profile of brachial plexus injury.
II. To analyse the functional outcome after physical and surgical management and follow-up.

## Materials and Methods:

Study Design: Prospective study
Duration: 6 months
Place of study: Department of Physical Medicine and Rehabilitation, Govt. Stanley Medical College and Hospital, Chennai

**Inclusion criteria:**

- All traumatic brachial injury patients with or without associated injuries.
- Patients of all age groups and both sexes
- Any racial and socio-economical denominations.

**Exclusion criteria:**

- Unconscious patient.
- Any patient unable to give proper history.
- Unwilling patient
- Acute trauma.

All the patients registerd in the physical medicine and rehabilitation section in the plastic surgery department Govt. Stanley Hospital were assessed. Initially 30-50 patients were planned to analyse. We have clinically assessed 35 patients of brachial plexus injury who presented at the Institute of Research Rehabilitation of Hand Department of Plastic Surgery from 1.5.2010 to 30.9.2010 and were followed for nearly 10 months. Assessment of each patient made and recording made in the proforma.

After the history recording inspection finding recorded and main examination is to exclude the involvement of root. Examination of trapezius muscle and rhomboidus muscle are important. We can see the contraction of rhomboidus muscle on adduction of scapula and we need to palpate the contraction of the muscle adduction of scapula against resistance. Same way latissimus dorsi muscle also seen contracting on coughing we need to palpate contraction of the muscle when shoulder is extended and adducted against resistance. Pectoralis major is having clavicular and sternal origin should be examined individually and recorded.

The examination of each root supplied muscles described below:

- Thumb: tests median nerve supplied by C6.
- Middle finger: tests median nerve supplied by C7.
- Little finger: tests ulnar nerve supplied by C8.
- C5: Shoulder movement in all directions, flexion of elbow (to some degree).
- C6: Flexion of elbow, rotation of forearm, flexion of wrist (to some degree).
- C7: Mainly a sensory trunk. (Produces generalised loss of movement in the arm, without total paralysis in any given muscle group. Always supplies latissimus dorsi).
- C8: Extension and flexion of fingers, flexion of wrist, hand movement.
- T1: Intrinsic muscles of the hand, e.g.adduction or abduction of fingers.

Sensory system examined on each dermatomes C5, C6, C7, C8 and T1 and a small area on the inner aspect of the arm supplied by T2 dermatome.Sensory modalities examined are touch using cotton, brush or Semmes-Weinstein pressure monofilament. Pain tested with pinprick and two-point discrimination tested at the finger tip by Manner felt apparatus consisting of two pins placed with distance of 2mm, 4mm, 6mm, 8mm,10mm and 12mm and recorder.

## Results:

A demographic analysis was done on 35 cases of brachial plexus presenting at our Institute and 20 cases belonged to C5, C6, C7 brachial plexus.

I. Age: Commonest involved as the 21-30 years age - 46% (Table 1).
II. Sex: Commonest involved is male 90% ( M : 18 to F : 2 ) (Table 2).
III. Level: The upper B.P.I contributed 57% of the total. (Table 3).
IV. Side: Common is right side which is about 60% (Table 4).
V. Mode of injury: R.T.A occupy about 77-80% of the cases (Table 5).

VI. Occupation: Students, manual labourers and sedentary workers being equally involved (Table 6).

VII. Associated injury: Common in the patients with upper brachial plexus injuries about 55% (Table 7).

VIII. Surgeries done: Upper BPI-8 patients were operated upon (Table 8).

IX. The results of the surgical correction was concerned, 75% of the patients had improvement (Table 9).

**Table 1:** *Age Distribution of Total BPI*

| S. No | Age distribution | Total cases | Upper BPI |
|---|---|---|---|
| 1 | 1-10 years | 03 | 00 |
| 2 | 11-20 years | 06 | 03 |
| 3 | 21-30 years | 16 | 13 |
| 4 | 31-40 years | 07 | 03 |
| 5 | 41-50 years | 03 | 01 |

**Table 2:** *Sex Distribution of Total BPI*

| | Male | Female |
|---|---|---|
| Total BPI | 31 | 04 |
| Upper BPI | 18 | 02 |

**Table 3:** *Level of Injury*

| Panpalsy | C56 | C567 | C8T1 |
|---|---|---|---|
| 14 | 09 | 11 | 01 |

**Table 4:** *Side of Injury*

| Side | Right | Left |
|---|---|---|
| Total | 21 | 14 |
| Upper BPI | 13 | 07 |

**Table 5:** *Mode of Injury*

| Mode of Injury | Total BPI | Upper BPI |
|---|---|---|
| RTA | 27 | 16 |
| Birth | 04 | 01 |
| Fall from height | 01 | 01 |
| Fall of weight Over shoulder | 01 | 01 |
| Industrial | 02 | 01 |

**Table 6:** *Occupation*

| Occupation | Total | Upper BPI |
|---|---|---|
| Student | 10 | 06 |
| Manual labourer | 12 | 05 |
| Sedentary worker | 13 | 09 |

**Table 7:** *Associated Injuries*

| | With associated injuries | Without associated injuries |
|---|---|---|
| Total | 19 | 26 |
| Upper BPI | 11 | 9 |

**Table 8:** *Surgeries Done for Upper BPI*

| Surgery done | No of cases |
|---|---|
| Neurolysis | 3 |
| Oberlin nerve transfer | 2 |
| Transfer of spinal accessory nerve to suprascapular nerve | 3 |

**Table 9:** *Results of Surgical Correction*

| Surgery done | Improved | Not improved |
|---|---|---|
| Neurolysis | 3 | 0 |
| Oberlin nerve transfer | 2 | 1 |
| Transfer of spinal accessory nerve to suprascapular nerve | 2 | 0 |

## Discussion:

In our study among the 35 patients who were analysed, the commonest age group involved was 21-30 years, which forms about 46%. The next common age group involved was 31-40 years which is about 20%. This group of individuals are important for the development of the family and the nation. Of these 35 patients, 20 patients had upper brachial plexus injury. Even among the patients with upper brachial plexus injury, the commonest age group was 21-30 years. Commonest sex involved is male 90% ( M: 18 to F: 2), most probably because it is the males who are the fast motor cycle riders and so more prone for such injuries. In one analysis of brachial plexus injury a survey of 100 consecutive cases from a Department of Neurosurgery, Belgium[6] showed the patient group comprised 80 M and 19 F 1M bilateral BPI ranging from 5 to 70 years of age. Causes of injury were largely sudden displacement of head, neck, and shoulder and included 27 motorcycle accidents. Loss was exhibited at C5-C6 in 19 patients, at C5-C7 in 15 patients, and at C5-T1 in 39 patients, and 8 patients had another spinal root pattern of injury. Nineteen patients had injury at the cord or the cord to nerve level. Associated major trauma was present in 59 patients. Emergency surgery for vessel or nerve repair was necessary in 18 patients. The surgical procedures performed included neurolysis alone in 12 patients and nerve grafting, end-to-end anastomosis, and/or neurotisation in 81, 5, and 47 patients, respectively. Brachial plexus injury represents

a severe, difficult-to-handle traumatic event. The incidence of such injuries and the indications for surgery have increased during recent years. Graft repair and neurotisation procedures play an important role in the treatment of patients with such injuries[6].

In our sudy out of the total of 35 patients involved with brachial plexus injury, 14 patients (40%) had total palsy which involved all the roots brachial plexus. The upper brachial plexus injury contributed 57% of the total. This upper brachial plexus injury consists of C5, 6 and C5, 6, 7 lesion categories. The C5, 6 level injury was seen in 9 patients (26%) and C5, 6, 7 lesion injuries was seen in 11 patients (31%). Patients with C8T1 injuries formed only 3% of the total brachial plexus injuries analysed. Thus, it is obvious that the second largest group of brachial plexus injury involves the upper trunks, and hence results of surgical correction are better. This is because results of C8T1 lesions are proved to be poor.

Side of injury common is right side which is about 60% probably due right being dominant tries to protect injury to other part of the body. So the dominant hand is commonly involved. Hence, the skills they learned in years together they lose in a few seconds. In our analysis R.T.A occupy about 77-80% of the cases. This compares with the review of western literature, where RTA forms about 60% of the cases. The next common mode of injury is gunshot injuries. In our series, the second commonest mode of traumatic brachial plexus injury was industrial accident (6%). In road traffic accident two wheeler accident is the most commonest one.

In another analysis Mayo Clinic[7] as the number of survivors of motor vehicle accidents and extreme sporting accidents increases, the number of people having to live with brachial plexus injuries increases. Although the injured limb will never return to normal, an improved understanding of the pathophysiology of nerve injury and repair, as well as advances in microsurgical techniques, have enabled the upper extremity reconstructive surgeon an opportunity to improve function in these life-altering injuries. The purpose of this review is to detail some of the current concepts of the treatment of adult brachial plexus injuries and give the reader an understanding of the nuances of the timing, available treatment options, and outcomes of treatment. Another analysis at Washington University School of Medicine[8], severe trauma to the brachial plexus most often occurs in young adult men and is a crippling injury that requires management in a timely fashion for optimal functional recovery and pain control. Current management options consist of primary repair in the acute setting, neurolysis, neuroma resection and nerve grafting, motor and sensory nerve transfers, and muscle and tendon transfers. Shoulder and wrist fusion can also play a role in the overall management of these patients. The total reconstructive process generally consists of more than one operation, and the postoperative rehabilitation is long and intensive. Nevertheless, with a highly motivated patient and a dedicated and specialised surgical team, the prognosis for functional recovery is good, and these patients can still lead productive and satisfying live.

In our study as far as the occupation of the patient was concerned, there was no appreciable difference, with students, manual labourers and sedentary workers being equally involved. Associated injuries like fracture clavicle, shoulder dislocation, fracture ribs, head injury were more common in the patients with upper brachial plexus injuries i.e. about 55%. This was high when compared with patients with total brachial plexus injuries having associated problems, which was about 42% only. This was probably because of the unique mode of injury in upper brachial plexus involvement, where, the forcible separation of the head and upper limb is the causative factor. Hence the force is borne by the head and the shoulder. Of the 20 patients with upper brachial plexus injuries, only 8 patients were operated upon. The rest of the 12 patients were lost to follow-up. The type of surgeries done were three in number. They were neurolysis (37%), nerve transfer of the spinal accessory nerve to the suprascapular nerve (37%), and Oberlin transfer (26%). Neurolysis refers to the surgery where the nerves are intact but engulfed in scar tissue, requiring a release of the scars which cause conduction blocks in the brachial plexus. The surgery of nerve transfer was done in the cases where the proximal nerve root was not available due to avulsion injury, and hence direct nerve suturing was not possible. In these cases, transfer of the intact spinal accessory nerve was done to the suprascapular nerve to achieve neurotisation of the supraspinatus and infraspinatus which would stabilise the shoulder. The third surgery of Oberlin transfer was done for the patients who had upper brachial plexus lesion for whom the neurotisation of the biceps and brachialis muscles was done with intact fascicles from the ulnar nerve and the median nerves.

Yet another analysis at University of Western Ontario, London, Canada[9], 4th analysis Traumatic brachial plexopathies can be devastating injuries. In addition to motor and sensory deficits, pain and functional limitations can be equally debilitating. Thirty-one

patients with a mean age of 32.7 years at the time of injury participated in this study. The mean time to surgery was 7.5 months, and the mean follow-up period was 42.7 months. Patients who underwent surgery within 6 months of injury scored consistently better on the disability of the arm, shoulder, and hand questionnaire.

There was no difference between supra- and infra-clavicular injuries; however, patients with root avulsion injuries were more likely to have pain and scored lower on the disability of the arm, shoulder, and hand questionnaire. Root avulsion injuries and delayed surgical repair correlated negatively with functional outcomes. As far as the results of the surgical correction was concerned, 75% of the patients had improvement. Surgical techniques include neurolysis, nerve grafting and neurotisation. Our studies in comparison to the reference almost same. Mode of injury, age, sex associated injury difficulty in management and advantage of early surgical intervention[6-9].

## Conclusion:

The study revealed that the productive age group of 21 to 30 years was commonly injured with brachial plexus injury. It was the males who were mostly involved. Panbrachial plexus injury formed a large chunk of the patients with brachial plexus injuries, but the second commonest involvement was the upper trunk lesion of C5, 6 or C5, 6, 7.

It was commonly the right side that was involved and thus involved the dominant hand. Road traffic accidents with two wheelers formed the majority of cases with brachial plexus injuries. The occupation of the patient did not show any significant difference whether student, manual labourers of sedentary worker was concerned.

The demographic pattern of injuries of brachial plexus was almost similar when the total plexus injury and the upper plexus injury were concerned, except in the presence of associated injuries, where, upper lesions appeared to have more percentage of associated injuries.

Outcome analysis revealed comparatively good results in surgical treatment of upper brachial plexus lesions, except in the Oberlin procedure of nerve transfer where the results were comparatively poorer.

Management of the patient is difficult pre- and post operatively.

A correct evaluation of the patient pre-operatively, and planning and execution of the correct surgical procedure and postsurgical rehabilitation are essential.

Nevertheless, with a highly motivated patient and a dedicated and specialised surgical team, the prognosis for functional recovery is good, especially in upper brachial plexus injuries, and these patients can still lead productive and satisfying lives.

Education of public regarding speed control, obeying traffic rules should be done especially for college students, who are the pillars of the countries, for prevention of brachial plexus injuries, which is much easier than curing these problems.Awareness programme for college students may be the solution.

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# PG Forum

## REHAB QUIZ

1. **Oppenheim's disease is characterized by**
   A) EMG finding of fibrillation and fasciculation
   B) Joint contracture
   C) Retarded muscle development
   D) Exaggerated deep reflexes

2. **All of the following conditions are indication of revision of total hip arthroplasty except**
   A) Incomplete fracture of the femoral stem
   B) Painful recurrent sublaxation
   C) Irritable dislocation
   D) Heterotopic bone formation

3. **Which is not true about prosthesis**
   A) False joint between the stump and prosthesis
   B) Good sensory feedback
   C) Limited task capability specially conventional prosthesis
   D) Feeling of heaviness because of unstable attachment with the body.

4. **Which of the following is the most important characteristic of lower extremity prosthesis?**
   A) Minimal; energy consumption
   B) Stability and security
   C) Ability to be used for stair climbing
   D) Enough weight to give forward pendulum motion

5. **A female paraplegic secondary to complete SCI**
   A) Have a vaginal delivery
   B) Experience orgastic sensation
   C) Have regular menstrual cycle
   D) All of the above

6. **F waves are**
   A) Variable in configuration
   B) Evoked by sub maximal stimulation
   C) Constant in latency
   D) All of the above

7. **Bizarre high frequency discharge differs from myotonic discharge in that**
   A) Bizarre high frequency discharge does not wax and wane
   B) Myotonic discharge does not wax and wane
   C) Bizarre high frequency discharge has a typical 'dive-bomber' sound
   D) They cannot be differentiated

8. **The peak of muscular activity of the calf muscle group is in**
   A) The early part of swing phase
   B) The late part of swing phase
   C) The early part of stance phase
   D) The late part of stance phase

9. **In normal walking the period of double support occupies how much of a complete two step cycle?**
   A) 10%
   B) 15%
   C) 25%
   D) 40%

10. **The simian hand is seen in a lesion of**
    A) Median nerve
    B) Ulnar nerve
    C) Median and ulnar nerve
    D) Radial nerve

### ANSWERS

**Answer of June 2014:**

**1**B, **2**C, **3**D, **4**B, **5**D, **6**A, **7**C, **8**B, **9**D, **10**C

Original Article

# Venous Thrombo-embolism Prophylaxis: Survey of the Rehabilitation Medicine Departments in the United Kingdom

*Fahim Anwar*[1], *Ahmad Al-Khayer*[2]


## Abstract

**Background:** Patients in rehabilitation medicine departments may occasionally develop deep venous thrombo-embolism (VTE). However, no VTE prophylaxis guidelines or consensus have been developed yet for this group of patients.

**Aim:** The aim of this study was to review the current practice of VTE prophylaxis in rehabilitation departments in the United Kingdom.

**Design:** Cross-sectional online questionnaire based survey

**Setting:** Link to online (www.kwiksurvey.com) survey questionnaire consisting of 13 items was e-mailed to the participant.

**Population:** British Society of Rehabilitation Medicine (BSRM) members.

**Methods:** One hundred eight-four e-mails were sent with a reminder in 6 weeks. There was a 40% response rate, 45 consultants, 3 staff grades and 26 specialist registrars responded, 63 responses were analysed.

**Results:** Majority of the units admitted patients from acute wards, other hospitals, nursing homes and homes. Stroke, multiple sclerosis, acquired brain injury and spinal injury were the major diagnostic groups; 66% of the respondents had a local policy for VTE prophylaxis; 62% were screening their inpatients for risk factors; 96% of the respondents were using mechanical methods of prophylaxis and 100% were using chemical methods of prophylaxis. Only 58% were monitoring their chemical prophylaxis. The criteria to stop the prophylaxis were very variable.

**Conclusion:** There is lack of consensus, among the rehabilitation units, regarding the need to screen patients, initiate and monitor prophylaxis.

**Clinical Rehabilitation Impact:** The need to develop national and international guidelines in this area is emphasised.


*Key words:* **Venous thrombo-embolism, rehabilitation, survey, United Kingdom.**

## Introduction:

Venous thrombo-embolism is often an underestimated preventable risk in hospitalised patients. The most common manifestation of VTE is deep vein thrombosis (DVT) in the lower limb. It is a very common and serious condition, resulting in prolonged hospital stay, increased readmission to the acute hospitals and huge economic cost to the healthcare system. The total direct and indirect cost of VTE to United Kingdom economy is approximately £640 million[1]. Furthermore, post-thrombotic syndrome (a complication of VTE) is also associated with lifelong limb pain, oedema and morbidity in the long-term[2,3]. Vascular damage is the triggering factor for DVT, but it can also result from vascular stasis from prolonged immobilisation.

VTE in majority of the patients is either symptomatic or present with minimal and atypical symptoms. Diagnosis based on the symptoms alone is not always easy and imaging techniques are necessary to confirm the clinical suspicion of VTE. Only 25% of patients with suspected DVT will have confirmed evidence following imaging[4]. Several risk factors have been implicated with increased risk of VTE in general population[5]. Presence of these

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risk factors should raise the suspicion of VTE in the presence of any other symptoms[6]. The objective of this study was to review the current practice of VTE prophylaxis in rehabilitation departments in the United Kingdom.

## Materials and Methods:

A 13-item questionnaire (Table 1) was devised to ascertain the current VTE prophylaxis protocols used in the rehabilitation units over the United Kingdom. The questionnaire underwent construct validation. Online survey was developed using the following website www.kwiksurveys.com. The survey was e-mailed to the 184 members of the British Society of Rehabilitation Medicine in May 2010. A reminder e-mail was sent in 6 weeks time.

Responses from doctors working only in outpatients or community rehabilitation medicine services were excluded. Each rehabilitation medicine department was only allowed one response; if there were multiple responses from the same unit only the consultant reply was included in the analysis.

## Results:

A total of 184 e-mails were sent. There were 32 faulty e-mails addresses. Seventy-four doctors filled the online survey questionnaire with a response rate of 40%; 63 responses out of these fitted the inclusion criteria. The 11 excluded responses included: two community consultants, two outpatients consultants and seven registrars as there were consultants responded from the same units. The responses that were analysed included 41 consultants, 3 staff grades and 19-specialist registrar/ specialty trainees.

Majority of the units admitted patients from acute wards (93%), other hospitals (92%) and home/nursing home/ care homes (76.2%). The major diagnostic groups of patients admitted by the rehabilitation units were stroke, multiple sclerosis, traumatic brain injury and spinal paralysis. Only 42 (66.6%) units had a local policy for VTE prophylaxis and only 30 (47.6%) stated that their policy was based on specific guidelines. Various guidelines mentioned on 24 occasions are summarised in Table 2.

When asked about the screening tools for VTE risk used by the units, 41 (65%) replied yes to using either locally or imported developed tools and 22 (35%) replied not using any screening tools. Fifty-seven (90.4%) units were using mechanical methods of prophylaxis and all 63 (100%) units were using anticoagulants (Table 3). Low molecular weight heparin (LMWH) was the most commonly used chemical prophylaxis agent; it was used by 68.2% of the units, 17.5% of the surveyed units used both LMWH and warfarin, 9.5% of units used aspirin, LMWH and warfarin whereas 4.8% used only aspirin and LMWH (Table 3).

Only 24 (38%) units were monitoring the patients on regular basis whilst they were on anticoagulants during inpatient rehabilitation (Table 4).

We also asked about the criteria used to discontinue anticoagulants in rehabilitation patient (Table 1). Ten (15.9%) units did not have any specific criteria to discontinue the anticoagulants whereas 17 (27%) units were discontinuing their anticoagulants based on the level of mobility. Time since injury was used as a criteria by 6 (9.5%) units and 30 (47.6%) units used both the level of mobility and time since injury to discontinue the anticoagulants. The results also show that 23.8% of the units had different VTE prophylaxis policy for different conditions, 25.4% of units had different criteria based on the source of patient's admission. Most of the units had no distinction between the upper and lower motor neuron lesions with only 9.5% of the units having different VTE prophylaxis criteria for upper and lower motor neuron lesions.

## Discussion:

The estimated incidence of symptomatic VTE is 0.2% in general population[7]. However, the real incidence of VTE is underestimated as it often difficult to diagnose and occasionally presents without any symptoms[8]. The prevention of VTE in patients, admitted to acute wards in hospitals, is often difficult and challenging. Depending on the diagnosis, these patients have 10% to 48% chance of having VTE[9]. Nicolaides *et al*[10] have shown that for every case of symptomatic non-fatal pulmonary embolism (PE), there are 2.5 cases of fatal autopsy-detected PE. The rates of VTE vary substantially across the spectrum of hospitalised patients[7]. Although the evidence for the use of VTE prophylaxis in acute hospitalised patients is very strong, there is very little evidence in the literature regarding the use of VTE prophylaxis inpatient undergoing rehabilitation in post-acute and chronic phases of their illnesses.

The results of this study show that the majority of patients admitted to rehabilitation units are from acute wards, and from other hospitals. The major diagnostic groups

include major trauma i.e., traumatic brain injuries, amputee; spinal cord injuries, stroke and other neurological conditions. Each of these groups is associated with high risk of VTE; there is also a temporary high risk of bleeding. Among patients who survive major trauma, the overall prevalence of DVT without prophylaxis exceeds 50%, depending on the type, site, and severity of the injury; reports in spinal cord injury patients show a DVT prevalence of 48-100% without prophylaxis[7].

Data from a large number of clinical trials[11-13] involving general surgery without VTE prophylaxis show that 15% to 30% of patients develop DVT. Patients with acute spinal cord injury have been reported to have the highest incidence of VTE among all the hospitalised patient groups[14,15]. On the other hand, patients who are admitted to acute medical units have eight-fold increase risk of VTE[2]. Various studies have reported incidence rate of 17-38% in myocardial infarction, 11-75% in stroke and 13% in patients with other serious medical conditions[16]. The risk of VTE also varies with the age and medical history of the patient; in all clinical scenarios, the prevalence tends to be higher in the elderly and in patients with a history of malignancy, hypercoagulable state, obesity, or previous episodes of VTE (Table 5). It is therefore important that appropriate prophylaxis is offered to every inpatient in order to reduce the significant mortality and morbidity associated with the VTE.

Majority (90.5%) units were using mechanical VTE prophylaxis methods including antithrombotic compression stockings, intermittent pneumatic calf and foot pumps. The evidence to support antithrombotic compression stockings is lacking. A Cochrane review[17] in 2003 showed that, the antithrombotic compression stocking were not able to reduce the risk of VTE in stroke patients. Intermittent pneumatic compression devices on the other hand are successful in emptying deep veins of the lower limbs, preventing stasis and thus reducing the risk of developing deep vein thrombosis[18].

With the introduction of new drugs that interfere with thrombus formation in recent years, the choice of methods of thromboprophylaxis has expanded considerably. All the rehabilitation units that participated in the survey used chemical VTE prophylaxis. However, there was no consistency or agreement on the choice of the chemical agents used. Sandercock *et al* demonstrated in a Cochrane review, that LMWH is more effective at preventing DVT and PE when compared to unfractioned heparin in stroke patients[19]. Gaber recommended the use of aspirin for thromboprophylaxis only where LMWH is contra-indicated[20].

All of the above considered, it should be remembered that patients in a rehabilitation unit, undergoing active rehabilitation, are different from patients in acute surgical or medical wards in many respects. Mechanical prophylaxis may or may not be suitable for patients in acute rehabilitation due to their position, skin condition or their inability to keep the device on during therapy session. Patients who are attending therapy sessions on daily basis would be in a less clinically hypercoagulable state as compared to patients with poor mobility and pressure sores. Presence of spasticity in this group of patients is a protective mechanism against the development of thrombo-embolism as this improves the efficacy of calf muscle pump[21].

Furthermore, the situation is more complicated by the fact that rehabilitation ward may have patients with medical, surgical illness or often combination of problems. The decision to start the VTE prophylaxis and which agent to use in a particular patient, is not straightforward. Several factors need to be considered before reaching a decision and diagnosis may influence the choice of anticoagulant used. A systematic review of the literature suggests that in patients with intracranial haemorrhages; the risk of bleeding outweighs the benefit of anticoagulation[22]. It is therefore, recommended that LMWH should not be used in this group of patients as a thromboprophylaxis agent[20]. The present results also show that only a small proportion of units had different policy/ guidelines for upper or motor neuron lesions, source of the patient and for different conditions.

Similarly once the VTE prophylaxis is started then the next question is: when to stop the prophylaxis? Again, this survey shows no agreement or consistency over the rehabilitation medicine departments in the UK. Various rehabilitation units across the United Kingdom either use the level of mobility, the time since injury or both to discontinue the VTE prophylaxis. As per the medical literature, the risk of thrombo-embolism falls dramatically in spinal cord injury patients after 12 to 16 weeks[23]; therefore spinal cord injury patients should receive VTE prophylaxis for at least 12 to 16 weeks post-injury. There are no clear guidelines regarding discontinuation of the prophylaxis for other groups of patients in rehabilitation. Bergqvist *et al*[24] in 1996 demonstrated a significant decrease in the rate of DVT

**Table 1:** *Survey Questionnaire*

| VTE Prophylaxis Survey |
|---|
| **1. Grade of the person**<br>a. Consultant b. Staff grade<br>c. Specialist registrar |
| **2. Do you admit patients from?**<br>a. Acute wards b. Other hospitals<br>c. Nursing home/home/care home |
| **3. Diagnostic group of patients admitted:**<br>a. Stroke b. Multiple sclerosis<br>c. Traumatic brain injury d. Other neurological conditions<br>e. Locomotors f. Amputee<br>g. Spinal injuries, spinal paralysis and other conditions |
| **4. Do you have a local policy for VTE prophylaxis in your unit?**<br>Yes No |
| **5. Is your policy based on specific guidelines?**<br>Yes No |
| **6. Do you screen all inpatient rehabilitation admissions in your unit for VTE risk?**<br>a. Locally developed tools b. Imported tool<br>c. No screening used |
| **7. Do you use mechanical method of prophylaxis?**<br>Yes No |
| **8. What mechanical methods of prophylaxis you use?**<br>a. Antithrombotic stockings<br>b. Only intermittent pneumatic compression devices<br>c. Foot pumps<br>d. Others |
| **9. Do you use anticoagulants for prophylaxis?**<br>Yes No |
| **10. What anticoagulant do you use?**<br>a. Heparin b. LMWH<br>c. Aspirin d. Warfarin<br>e. Other |
| **11. How do you monitor the patient on anticoagulants?**<br>a. No monitoring used<br>b. INR Weekly Alternate days<br>c. APTT ratio Weekly Alternate days<br>d. Coagulation profile Weekly Alternate days<br>e. Platelets Weekly Alternate days |
| **12. Do you have specific criteria to stop anticoagulants?**<br>a. No specific criteria<br>b. Level of mobility<br>c. Time since injury<br>d. Both levels of mobility and time since injury |
| **13. Do you have a different VTE prophylaxis approach or guidelines for?**<br>a. Upper and lower motor neuron lesions<br>b. According to source of the patient<br>c. For different conditions |

**Table 2:** *Guidelines Mentioned by Various Rehabilitation Units*

| Guidelines Mentioned | |
|---|---|
| Trust guidelines | 10 |
| National health services (NHS) / Department of Health VTE guidelines | 3 |
| North West VTE Prophylaxis guidelines | 1 |
| Guidelines used in spinal injuries unit | 1 |
| Orthopaedic guidelines for fracture neck of femur, acute hospital guidelines for medical patients and local practice at the spinal injuries unit | 1 |
| Meta-analysis in Archives of Physical Medicine | 1 |
| Stroke guidelines | 1 |
| The American Standing Committee guidelines 1997 | 1 |
| Guidelines based on scoring system with a number of risk factors | 1 |
| International Spinal Cord Society and American Spinal Injury Association guidelines | 1 |
| Disability and Rehabilitation | 1 |
| Developed clinical criteria | 1 |
| Scottish Intercollegiate Guidelines Network (SIGN) | 1 |

**Table 3:** *Methods of Prophylaxis used in Rehabilitation Units*

| Question | Response in Yes |
|---|---|
| **Do you use mechanical methods of prophylaxis?** | 57 (90.5%) |
| • Antithrombotic compression stockings | 45 (71.4%) |
| • Intermittent pneumatic compression devices | 9 (14.2%) |
| • Foot pumps | 3 (4.8%) |
| • Other | 0 |
| **Do you use anticoagulants for prophylaxis?** | 63 (100%) |
| • Heparin | 0 |
| • Low molecular weight heparin (LMWH) | 43 (68.2%) |
| • Aspirin | 0 |
| • Warfarin | 0 |
| • Aspirin and LMWH | 3 (4.8%) |
| • Aspirin, LMWH and warfarin | 6 (9.5%) |
| • LMWH and warfarin | 11 (17.5%) |
| **Do you have a different VTE prophylaxis approach or guidelines for:** | |
| • Lower motor neuron/Upper motor neuron lesions | 6 (9.5%) |
| • Source of the patient | 16 (25.4%) |
| • Different conditions | 15 (23.8%) |

in hip replacement patients who received prophylaxis for 30 days with 40 mg of enoxaparin when compared with placebo[19]. Gaber suggested discontinuing the prophylaxis when the patient gains independent mobility and four months from the time of onset[2].

**Table 4:** *Monitoring used for Patients on Anticoagulants*

| Question | | Response in Yes |
|---|---|---|
| **Do you monitor the patients on anticoagulants?** | | 24 (38%) |
| International Normalized Ratio (INR) | Weekly | 7 |
| | Alternate days | 5 |
| INR and APTT Ratio | Weekly | 2 |
| | Alternate days | Nil |
| INR and Platelets | Weekly | 4 |
| | Alternate days | Nil |
| Coagulation Profile and Platelets | Weekly | 3 |
| | Alternate days | Nil |
| Platelets | Weekly | 3 |
| | Alternate days | Nil |
| INR and Coagulation Profile | Weekly | 1 |
| | Alternate days | Nil |

**Table 5:** *Risk Factors for Venous Thrombo-embolism Adopted from Scottish Intercollegiate Guidelines Network*

| Risk Factor | Associated Increased Risk |
|---|---|
| **Age** | Exponential increase in risk with age in the general population:<br>Less than 40 years Annual risk 1/10,000<br>60-69 years Annual risk 1/1,000<br>More than 80 years Annual risk 1/100 |
| **Obesity** | BMI more than 30kg/m2 associated with 3 times increased risk |
| **Previous VTE** | Recurrence rate of 5% per year, increased by surgery |
| **Malignancy** | Several times increased risk |
| **Hormone therapy** | Hormone replacement therapy associated with 2-3 times increased risk<br>Oral contraceptives associated with 3 times increased risk<br>Tamoxifen associated with 3 times increased risk<br>High dose progestogens associated with 6 times increased risk<br>Raloxifene associated with 3 times increased risk |
| **Pregnancy** | Associated with 10 times increased risk |
| **Immobility** | Bed rest of more than 3 days, plaster casts and paralysis associated with 10 times associated risk |
| **Hospitalisation** | Acute trauma, acute illness and surgery associated with 10 times increased risk |

To our knowledge no such surveys has been conducted in United Kingdom or elsewhere and therefore our findings are not comparable. The limitation of the study is that the survey is entirely United Kingdom based with only 40% response rate. It would be worthwhile if similar survey could be conducted over different centres across the world and the practices compared in order to reach consensus for VTE prophylaxis.

## Conclusion:

In conclusion, the need for some type of thromboprophylaxis regimen must be instituted in all patients in rehabilitation centres unless the patient is fully mobile with or without aid. The practice of VTE prophylaxis in rehabilitation units across United Kingdom is very variable. There is a clear need to establish national or international guidelines or consensus for the VTE prophylaxis in rehabilitation medicine departments. There is also a need to constantly revise those guidelines as dictated by the medical research in this area.

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