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Abstract: Sir Hugh Owen Thomas descended from a long line of Welsh bone-setters. He stressed on the importance of rest in treatment and was responsible for many landmark contributions in the field of orthopaedics. He is especially celebrated for his design and use of splints; the famous Thomas knee splint is still in wide use in emergency departments and Orthopaedic units in hospitals worldwide. Many a time’s assessment of fracture reduction becomes difficult as the Thomas splint obstructs the view. We tried to reduce these problems by modifying the Thomas splint into a radiolucent one by using nylon. This radiolucent splint not only allows repeated radiography to provides clear image without any superimposition but more importantly these repeated radiographs do not cause any pain and discomfort to the patient.

Key Words: Thomas splint, Sir Hugh Owen Thomas

Introduction:
Sir Hugh Owen Thomas descended from a long line of Welsh bone-setters. He stressed on the importance of rest in treatment and was responsible for many landmark contributions in the field of orthopaedics. He is especially celebrated for his design and use of splints; the famous Thomas knee splint is still in wide use in emergency departments and Orthopaedic units in hospitals worldwide.[1-3] Its basic design has changed little since its first description by Sir H O Thomas in 1875 Except for minor modifications like Pearson’s knee flexion unit and Hodgen’s removal of posterior half of the ring, the basic design still remains the same.[4-6] The outer bar was made to angulate outwards to accommodate the trochanteric region. The popularity and success of the Thomas splint can be attributed to the simplicity of its design, the ease of use and its effectiveness in immobilizing fractures of the lower limb, thereby reducing the morbidity and mortality associated with these injuries.

Thomas splint is used as a primary splint for the fractures around the hip and fractures of the shaft of femur for temporary immobilization. Overlap of either the ring or the side bars on the radiograph can cause difficulty in assessment of the fracture. This often necessitates repeat X Rays after either removal or loosening of the splint, causing great discomfort and pain to the patient. It also needs more manpower, leads to increased exposure to radiation and causes unnecessary delay.

One of the treatment modalities of paediatric femoral shaft fractures is immobilization in a Thomas splint with fixed traction for initial 2 to 3weeks followed by application of hip spica.[7,8] In such cases frequent assessment of reduction and alignment of fracture by repeated X rays is a must. Many a time’s assessment of fracture reduction becomes difficult as the Thomas splint obstructs the view. We have addressed these problems by modifying the Thomas splint into a radiolucent one by using nylon. This radiolucent splint not only allows repeated radiography to provides clear image without any superimposition but more importantly these repeated radiographs do not cause any pain and discomfort to the patient.

Materials and Methods:
After carefully assessing different materials like Teflon, PVC plastic pipes, nylon and other materials for their radiolucency, nylon was chosen as it was more radiolucent and easily available. This splint is made up of three parts - ring, sidebars, and a distal W shaped end piece of commonly required sizes (Figure 1). Each of these can be detached and reattached with any combinations so that it is easier to carry, store and maintain the splint. For heavier limbs an extra metallic supporting frame in addition to nylon bars is designed which can be easily removed while taking x-rays.
and can be put back without removing the splint and disturbing the fracture site (Figure 2).

Figure 1: Parts of the modified radiolucent Thomas splint.

Figure 2: Assembled splint with outer reinforcement, which is used in bulky patients.

Figure 3: Fixed traction applied through modified Thomas splint.

For the last one year we have been using this splint for immobilizing all the fractures of hip and femur with fixed traction (Figure 3). These splints are also being used in treating the fracture shaft of femur, inter-trochanteric and sub-trochanteric fractures in children with fixed traction before the reduction, during the reduction under image intensifier and to maintain the reduction till early union and spica application. Radiograms are done with the splint on whenever necessary.

Results
The main purpose of the modified splint was to give better comfort to the patient while x-rays are taken and to keep the fracture site undisturbed during the treatment. Elderly patients were more comfortable and satisfied as the splint was light weight and was not removed during radiography. In children this splint was extremely useful not only for immobilization but also during the reduction under anaesthesia. A gentle attempt was done to correct excessive overriding and angulations by increasing the traction and corrective padding. Image intensifier pictures were satisfactorily clear with the splint on and there was no need for oblique views. Splint was better accepted as it was lighter in weight as compared with the regular Thomas splint.

The complications encountered with the modified splint were negligible when compared to the metal one, which can cause pressure sores, limb strangulation, and even urethral injuries.[9]

As this was a detachable three piece splint it was easy to handle and store. Cleaning and maintenance of this splint was far easier when compared to the metal splint. The stains of blood and other contaminants were cleared of from the splint more effectively and effortlessly.

We encountered bending of the bars when excessive load was applied. This problem was addressed effectively by supporting the bars in heavily built patients by a metal frame which was attached to the main splint through the hinges, which could be easily removed while taking x-rays and put back without removing the splint and disturbing the fracture site.

Discussion
Orthopaedic surgeons have been using Thomas splint for ages in treating lower limb fractures both in adults and in the paediatric age group. Our modified Thomas splint is made up of nylon rods and has a detachable supporting frame for heavier limbs. The main objective of making a radiolucent splint was to make it more convenient for the patient and the treating surgeon. The x-rays can be taken without removing the splint, at regular intervals and throughout the period of immobilization or treatment.

There are few complications reported in the literature with the Thomas splint like pressure sores in the groin, strangulation of the limb and even few cases of urethral injuries. Such kind of complications can be avoided with the use of nylon splint as it is much lighter compared to the metal one (Average weight of metal splint – 5 kgs, Average weight of nylon splint- 2 kgs).

Good results have been reported in the literature in treating patients with fractures of the proximal Femur, who are medically unfit for surgery using Thomas splint.[1,10] Over the past few decades few changes have been made in the original Thomas splint, but this modified radiolucent Thomas splint tries to address the major drawback of overlap of the radio-opaque ring and side bars of the splint on the skeletal part of the hip and thigh during treatment (Figure 4,5,&6).
complications are less and it is more convenient for the patient, while on treatment and during regular check x-rays, especially while treating fracture shaft of femur in children conservatively.

In addition that it avoids some common complications, the maintenance of this nylon splint is much easier when compared to the regular Thomas splint. The only disadvantage is the cost, machinery to manufacture and its availability. This problem has been partly managed by the modular nature of the splint wherein different sized rings could be incorporated with detachable rods, needing a smaller inventory.

It is known that fracture when treated conservatively, unites faster if the fracture site is not disturbed by frequent removal of the splint used for immobilization. This becomes possible while treating patients with this modified Thomas splint as there is no need for splint removal during the treatment phase. Encouraged with our experience with the radiolucent splint, corroborated by positive results and satisfaction of both the patient and surgeon, we are in the process of making few more modifications like collapsible ring and collapsible bars, making one splint which can be used for all age groups for both sides. Our experience with this radiolucent Thomas splint has been very satisfactory in the initial splinting and treatment of common hip and femur fractures in the elderly and children and we strongly recommend its use.

References: