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## On Using Weight Relieving Orthoses in In-Operable Conditions of Lower Limbs in Middle Age and Old Adults.

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### ABSTRACT

Lesions of lower limbs in middle aged or old adults with medical problems like elevated renal parameters pose a challenge to surgeons. This is because of anaesthetic risks or local factors causing increased chance of torrential bleeding. In such patients, the need is immediate mobilization to avoid recumbency. Three diabetic males (two under 60 and one 79 years old) with elevated renal parameters presented to us. They had acute bi-malleolar fracture, acute fracture of the lower third shaft of femur and fibrous dysplasia of proximal femur. Of these three, one was on hemo-dialysis, while the remaining two were incidentally found to have contracted kidneys and elevated renal parameters. Deformed Pagetic femora are more prone for non union and have more chance of intra-operative bleeding with more mortality. Same is the case with fibrous dysplasia where torrential intra operative bleeding is expected from the lesion. In general renal patients have more risk of death. Their reduced excretory function cause high blood urea nitrogen, creatinine, acid, potassium, salt, and water. They also have additional likelihood of intra operative bleeding and post operative infection. To mobilize such poor risk patients, a custom made weight-relieving orthosis is made with its upper end molded to support the inferior aspect of the ischial tuberosity. This relieves the injured part or lesion from loading during the stance phase. The patients were allowed mobilization as an when they wanted. Thus this orthosis was useful especially in individuals whose results of anaesthesia and surgery on the affected bones are uncertain where one requires early mobilization

**Keywords:** Early mobilization, Paget's disease, Fibrous dysplasia, Chronic -Renal failure, Bleeding, mortality, Weight relieving orthosis

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## INTRODUCTION

In a middle aged or old adult, fractures of the lower limb bones need to be stabilized early for immediate mobilization. Similarly in the same age group, the painful non-traumatic conditions of the lower limb bones need to be mobilized at the earliest. Often a surgeon come across either a middle aged or old adult with medical problems like elevated renal parameters and is declared unfit for any anaesthesia. Sometimes such patients could not be operated because of local factors like increased chance of heavy bleeding. Also, surgical intervention in certain conditions is far riskier than the condition left alone. For example Paget’s disease of lower third of femur carries a 68 percent risk of death if operated. In such cases the only other options are either a prolonged skeletal traction or external fixation under local anaesthesia. Recumbency is unsafe especially in patients who had crossed middle age that too with medical diseases. The need is a method to mobilize the surgically unfit patients with painful lesions or fractures of the lower limbs to avoid complications of recumbence as early as possible [1-8].

## MATERIALS AND METHODS

Between 2011-2013 we had three male patients with one patient having a bi-malleolar fracture, another fracture of the lower third shaft of femur and the third having fibrous dysplasia of proximal femur. All the three were diabetic. One patient was a known chronic renal failure case already on hemo-dialysis, while the other two had incidental finding of a contracted kidney and elevated renal parameters. In these cases we have applied the technique of Weight Relieving Orthosis (WRO) and relieved the injured part or lesion from loading during the stance phase of walking. The patient was trained to wear the orthosis and slowly ambulate with walker initially and to discard walker when he feels confident. In the case of the two patients with fractures we used inj Larinox<sup>®</sup> in the initial 2 week period for prophylaxis for venous thrombosis. The custom made WRO was fabricated by Ottoboch<sup>®</sup>.

**Table 1: Details of the three cases treated with weight relieving orthosis**

S .no	Name	Diagnosis	Profession	Age in years	Reason for in-operability	Result	Problems
1	Mr.V	Bimalleolar fracture	Lawyer	80	Chronic renal failure , un controlled diabetes late presentation	Acceptable	There was minimal subluxation of the joint was acceptable
2	Mr.J	Shaft of femur fracture in a Pagetic bone	Farmer	65	Contracted kidneys Chronic renal failure	Acceptable	There was shortening of 6cm compensated by HSR
3	Mr.M	Fibrous dysplasia	Teacher	50	Contracted kidneys Chronic renal failure	Acceptable	No specific problem

The method of fabricating the WRO is out of the scope of this paper. In short, first a plaster of Paris mold was taken of the affected thigh starting from the ischial tuberosity to cover the entire thigh. More importantly in the upper end this mold is contoured so as to support the inferior aspect of the ischial tuberosity during stance phase of the patient's gait. Plaster of Paris is poured inside this mold. A corset is made from this cast with specific care to fabricate the upper end to support the inferior aspect of the ischial tuberosity thus bearing the weight of the body. The measurement from the ischial tuberosity to the foot length is done. Side bars are given extending from this corset to end in a foot part of the orthosis which is at a distance of 2cm longer than the patient's foot so that the foot does not touch the inner sole. A custom made WRO is shown in figure 1. This WRO is fitted and walking training is started with the help of a senior therapist. The details of each patient is presented below in a table 1



**Figure1. A custom made Weight Relieving Orthosis for a lower limb. The arrow pointing to the contoured part thigh corset that supports the ischial tuberosity**



Figures 2 and 3. The initial X-rays of the second gentleman showing diffuse thickening of the cortex and the typical broken –chalk appearance of a pathological fracture of lower third of the Pagetic femur.

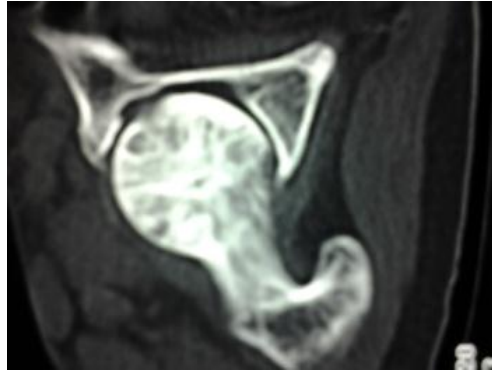


Figure 4. CT section of the affected side head of the pathological Pagetic femur which fractured in its lower third. the disorder in architecture is seen



Figure 5. Patient 2 pathological fracture of the Pagetic femur seen standing with his orthosis on.



Figure 6. The exact site of weight relief at the ischial tuberosity is seen from behind. An arrow is seen pointing his area of weight relief.



Figure 7. The second patient's X-rays at 4 months follow up showing the amount of callus and union.



Figure 8. The patient is seen raising a straight leg at 4 months follow up. Figure 7.



Figure 9



Figure 10

Figure 9 and 10 shows the ability of the patient to walk without support at 5 months however, with residual shortening of his left lower limb to be managed with a heel and sole raise.

## RESULTS

With WRO, the 16<sup>th</sup> day after injury, our first patient, a senior criminal lawyer with a ser bi-malleolar fracture climbed stairs of a court building went to argue a sensitive case at a local court. The court room was in the first floor. At six months follow up, he was ambulant with minimal sub-luxation of the ankle. The second gentle man with femoral fracture in his Pagetic bone is illustrated below in figures 2 to 10. His initial X-rays are seen in figure 2 and 3. The femoral head CT section is seen in figure 4. He is seen wearing his orthosis in figure 5. The exact site of weight relief at the ischial tuberosity is seen from behind in figure 6. His 4 months follow up X-rays show the amount of callus and union. Figure 7. The patient is seen raising a straight leg at 4 months follow up. Figure 8. His fracture united and patient was able load his lower limb

without support figures 9 and 10. The third patient with fibrous dysplasia was still using the WRO.

## DISCUSSION

Pathological bone's architecture and deformities cause difficulties in interventions if they are fractured. In one study 33 such pathological fractures were attributed to Paget's disease.

Poor bone quality and pre fracture deformity, makes a Pagetic femur fracture a test for the surgeon. In another series, 11 such acute femoral fractures with Paget's disease are stabilized with a solid 9mm AO femoral nail. Three cases needed reaming due to severe deformity. All united in a mean time of 32 weeks except one who developed Pagetic Sarcoma and died 23 months after surgery while the others healed.

A larger study of 182 femoral fractures with Paget's disease concluded that these are dangerous fractures. The study also found that the sub trochanteric regions as more prone for non union. Especially the fractures of the lower third of shaft had the highest incidence of deaths and non union when operated. Pagetic femur In this group the study recommends conservative treatment.

This higher risk of non-union if operated and the presence of elevated renal parameters are the reasons for WRO in the second femur fracture case apart from increases bleeding chances from such a bone if reamed. Certain risks pertaining to the medical condition of the patient also reduce the chance of intervention in fractures. A longitudinal glomerular filtration rate (GFR) assessment showed an independent, graded association between a reduced estimated GFR and the risk of death, cardiovascular events, and hospitalization in more than a million adults patients who had not undergone dialysis or kidney transplantation, due to reduced excretory work of the kidney, there occurs an high blood urea- nitrogen, creatinine, along with a reduction in acid, potassium, salt, and water excretion . There is also an increase chance of bleeding due to platelet dysfunction. In addition such patients have higher morbidity from surgery due to volume overload, and infections. The above underscore the need for early involvement of a nephrologist.

All our three cases were seen by a nephrologist and were advised oral bicarbonates and fluid limit in two cases and dialysis in one cases. A fifty percent fall in the blood flow to the kidney is reported while general anaesthesia is administered causing a reduced excretion of certain drugs which may be nephrotoxic. Procedures like the nailing of a fracture in a Pagetic bone or curettage of a fibrous dysplasia where large fluid shifts, blood loss are anticipated are categorized as having a high cardiovascular risk. However in general orthopaedic procedures carry an intermediate cardiovascular risk < 5%)

In the present study, the first case had a simple bimalleolar fracture with high urea and creatinine with baseline creatinine 5mg /dl. He is a known ischemic heart disease patient. He had a home-kit for dialysis.

In addition to the moderate risk from his chronic renal failure, he also had an uncontrolled diabetes mellitus, hence this gentleman with bimalleolar fracture could not be operated immediately, was given this treatment of early WRO.

Our second case had a lower third fracture of femur with Paget's disease with a high risk torrential bleeding during reaming. He also had chronic renal failure which will restrict his rapid fluid restoration. He also had a high risk of non-union even if operated, hence was given this treatment of early WLO.

In the present study, the third case had a fibrous dysplasia of proximal femur with high chance of severe bleeding during surgery. There are no definite indications for the surgical treatment of fibrous dysplasia. Sometimes intra operatively gaining anchorage of the implant is a problem as there is no normal bone. In some patients with fibrous dysplasia even with surgical fixation they will need assisted ambulation. As this patient carried the risk of major shift of fluids requiring again a massive fluid administration to counter bleeding, which is difficult as he had a chronic renal failure also a WRO was given soon after the diagnosis.

A type of WRO called Salford Cosmetic Brace was used in majority of 33 of 36 polio myelitis patients but only for one fracture in an osteomyelitic bone.

### CONCLUSION

Weight Relieving Orthosis is a practical and safe device to deal with a variety of orthopedic conditions where one requires to either temporarily or permanently off-load the affected lower limb bones. This allows early mobilization especially in patients where the results of anesthesia and surgery on the affected bones are uncertain.

Note: The authors declare no conflict of interests

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