

ISCHIAL WEIGHT BEARING BRACE WITH QUADRILATERAL WOOD TOP— PRELIMINARY REPORT

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The development of the quadrilateral socket for the above-knee amputee and the extensive use of this socket have led to improved understanding of the principles of weight distribution on the artificial limb. Although there are many problems which must be solved with regard to the adaptability of the quadrilateral socket for the above-knee amputee, there is universal agreement on the advantages of ischial weight bearing.



Figure 1. The quadrilateral, wood top ischial weight bearing brace is cosmetically acceptable, comfortable and light in weight. (Figures 1 to 8 in this article are from photographs by Stanley Simmons of the N.Y.U. Bellevue Medical Center.)



Figure 2. The socket of the brace is easily opened and closed. The opening is wide enough to allow the thigh to fit into from the front.

The principles of ischial weight bearing have been applied in disabilities of the lower extremities in patients other than amputees. Braces have long been made incorporating the high thigh cuff and the Thomas ring or some modification of it. Most physicians have become doubtful of the efficiency



Figure 3. When the socket is closed, the ischial seat is held reliably in place without rotation.



Figure 4. The accurately fitted and aligned brace will transfer weight to the ischium at heel contact, with the knee locked.

of the ring type gluteal or ischial support where it is desired to relieve a lower extremity of weight bearing through the long bones. The principle of the quadrilateral socket in our experience, applied to bracing of the lower extremity, has made it possible to control the degree to which the weight bearing responsibility of the long bones can be relieved.

In cases of instability of the hip joint, failure of union of a fracture of the femur, particularly the neck of the femur and in cases where there is massive loss of the bones comprising the hip joint, the long leg brace with an ischial ring has been seriously disappointing. The gait of patients wearing such braces is altered by the leverage forces placed upon the femur which cannot withstand the physical stresses. Such patients have uniformly been using crutches in addition to the brace.

When weight is transferred directly from the ground to the pelvis the pelvic lever is much shorter so that the muscular effort of maintaining balance is considerably reduced. It is through the use of the quadrilateral socket that weight can be transferred to the pelvis in the lower extremity brace.

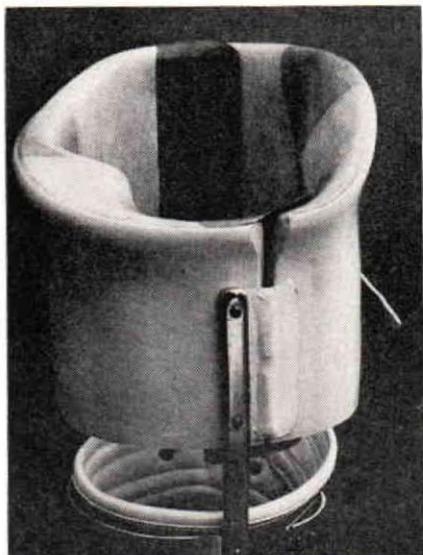


Figure 5. The closed socket is completely smooth inside even when the lateral edges are not in contact. Initial fit should allow about $\frac{1}{2}$ inch space laterally.

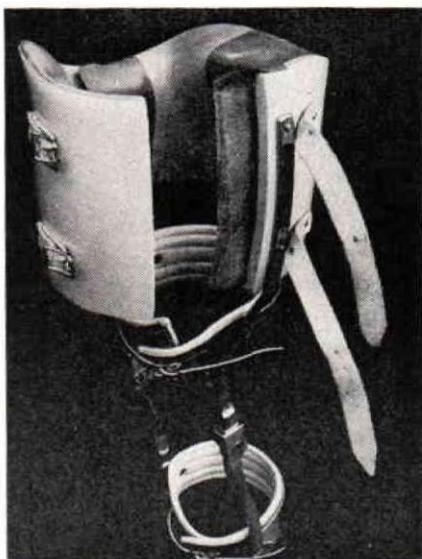


Figure 6. The leather tongues are glued to the posterior portion of the socket. The edges are tapered.



Figure 7. The open socket demonstrating the higher anterior and lateral walls. These are modified for this patient and are lower than the UCLA specifications.

The socket is made with an open end in the same way as it is for an amputee. The anterior wall of the socket is then cut out and hinged medially with straps and buckles laterally for closure. This makes it unnecessary for the patient to put the foot and the knee through the socket opening. The patient's leg enters the brace through the front. The cut margins of the anterior wall are protected by carefully shaped leather tongues so that when the socket is closed the interior is smooth and continuous. The shrinkage problem and loss of fit is not encountered with the use of the brace since this can be adjusted through the tension in the straps. The brace is made with double drop locks at the knee for most patients. When partial weight bearing can be permitted the knee center can be set far back by curving the side bars and the knee allowed to swing when the brace is off the ground. The length of the side bars should be carefully calculated so that the patient's heel within the shoe is not bearing weight when he is standing in the brace. Most patients do not require any type of suspension for this brace if the lateral and anterior walls do not have to be modified from the UCL A socket design.

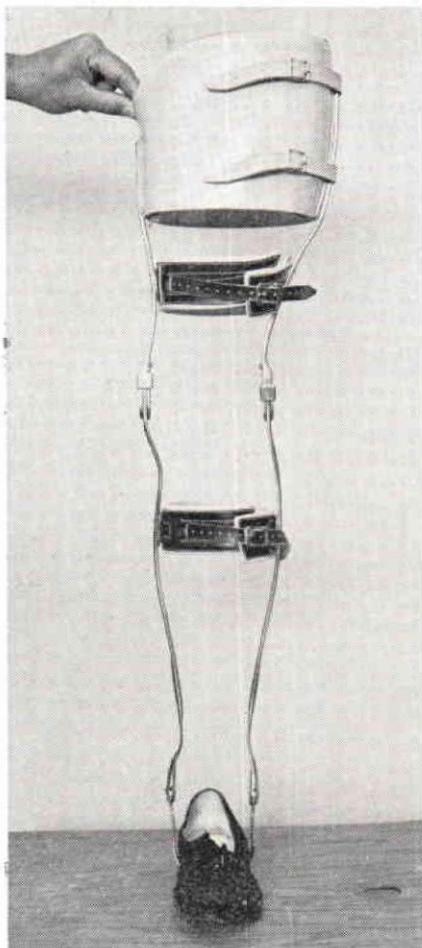


Figure 8. The brace is simple. The wood top eliminates the need for metal bands to stabilize the bars. The four buckles are easily adjusted by any patient. Accurate shaping and fitting of the bars is facilitated by the simplicity.

Suspension in the form of hip joint and pelvic band or Silesian type belt can be used when necessary for additional stability and prevention of rotation within the brace.

Twenty such braces have been made within the last five years without a failure in terms of function. This may be attributed to the fact that the cases were carefully selected. A number of these patients had failed to function in a conventional type lower extremity brace with a full thigh cuff and padded ring type weight bearing support. By utilizing the existing brace and adjusting the length of the side bars they were able to walk without assistance with a quadrilateral wood socket on the brace. We are convinced by the control comparison of these patients having used both types of weight relieving mechanisms of the efficiency of ischial weight bearing and the superiority of the quadrilateral wood socket. Such a brace has been successfully used for a 93-year old veteran with a completely disrupted hip joint due to failure of several surgical procedures to correct non-union of a fracture of the neck of the femur. It has been used in cases of tumor of the femur with loss of bone, completely flail lower extremity in cases of polio, markedly unstable painful knee joints, and in postoperative failures following hip arthroplasty.

It is necessary that physicians and orthetists seriously consider the adaptation of the quadrilateral wood socket to the long leg brace for purposes of eliminating weight bearing through the long bones of the lower extremity where it is imperative that the brace be efficient.

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