The Lerman Multi Ligamentus Knee Control Orthosis

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Developing an effective Ligamentus Knee control orthosis has been the goal of the orthotic profession for decades. Numerous innovative knee control orthoses are in common use today, all of which have their merits. The development of the Lerman multi ligamentus knee control orthosis was based on some of these existing designs with a few innovations. The Lerman orthosis was developed to overcome some of the drawbacks of previous knee orthoses, which include:

- Lack of *total* knee control.
- Difficulty of donning and doffing.
- Discomfort and pressure over the tibial crest.
- Complexity of fabrication.
- Distal migration.
- The need for very precise measuring techniques.
- The difficulty of changing contours of the uprights without disturbing the alignment of the knee joints.

The Lerman multi ligamentus knee orthosis took seven years to develop, and was modified and tested on over 250 patients. The results from the present design are excellent; no rejections and an insignificant number of adjustments or modifications have been seen.

The orthosis is designed to provide the following functions:

Medio-Lateral Stability

Medio-lateral stability is achieved by plastic posterior femoral and tibial bands which are attached to medial and lateral uprights with knee joints. These are long enough to provide adequate leverage. In addition, the unique floating medial and lateral condyle pads provide total contact through the complete range of motion to stabilize the knee. (Fig. 1)

Anterior-Posterior Stability

The anterior and posterior motion of the tibia in relationship to the femur is controlled by the floating condyle pads, by virtue of their universal hinging system attachment combined with total contact at the femoral and tibial condyles. (Fig. 2).

Derotation and Rotational Control

Derotational control is established by the encircling total contact gum rubber straps.

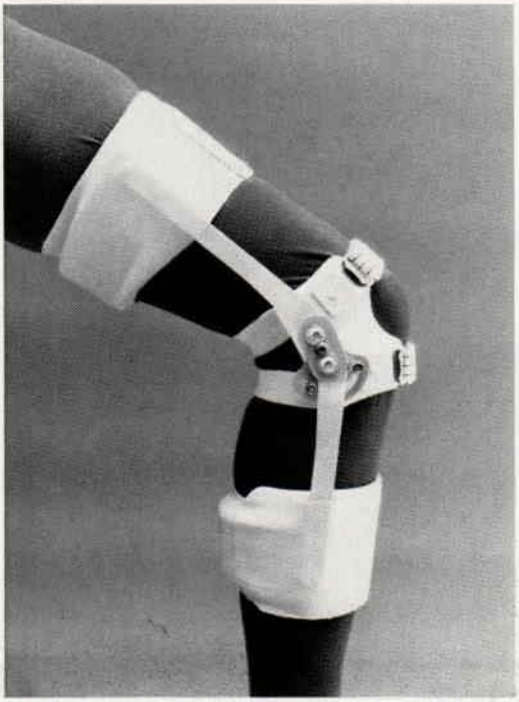

Fig. 1

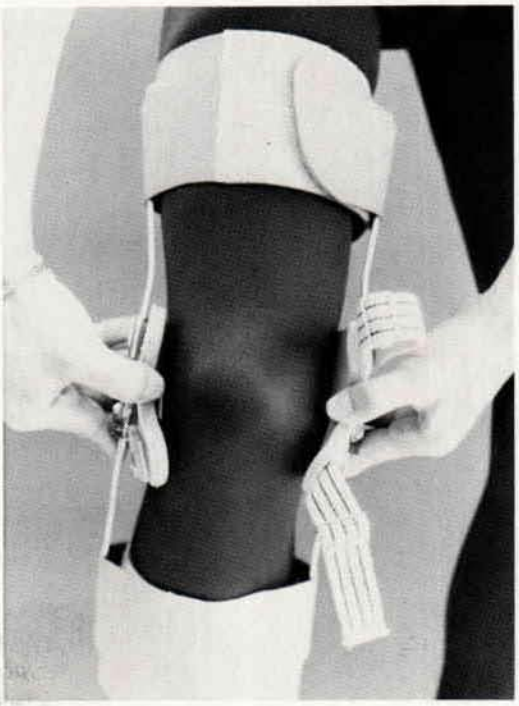

Fig. 2

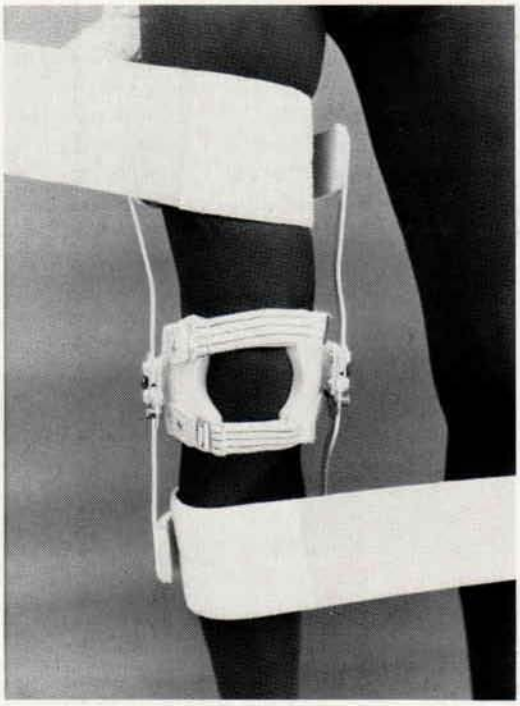

Fig. 3

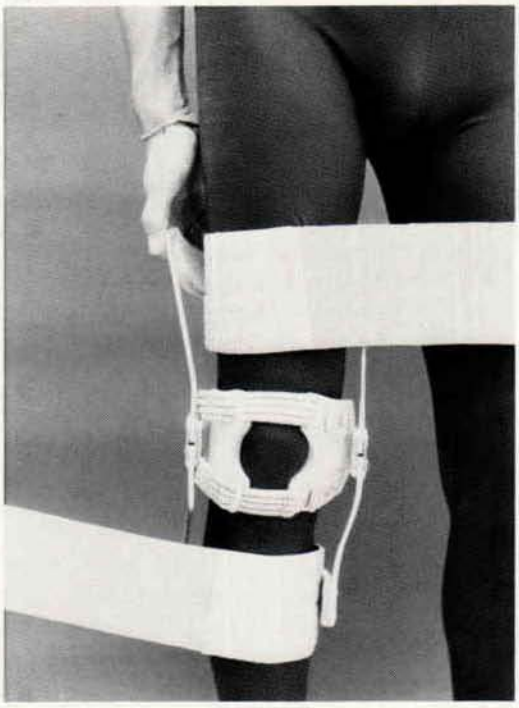

Fig. 4

These straps originate at the center-inside aspect of both the femoral and tibial bands (Fig. 3). The direction of the pull is opposite to one another, resulting in a torquing effect designed to derotate the knee joint. The direction of these straps may be changed as determined by the nature of the treatment (Fig. 4). For example, to protect the anterior cruciate ligament, external rotation of the tibia should be restricted; the direction of the tibial strap pull would be lateral to medial, and the pull of the femoral strap is in the opposite direction. The opposite strap arrangement is provided when internal rotation of the tibia is to be controlled. To derotate in both directions an extra derotation strap may be added, however the extra strap is not needed if both the femoral and tibial strap go in the same direction; the direction of the strap pull is determined by the comfort of the patient in this case.

Patellar Tracking and Distal Migration

Patellar tracking is provided by the floating condyle pads. These pads control the lateral and medial displacement of the patella through the full range of motion. The proximal and distal elastic patella straps prevent the distal migration of the orthosis and secure the condyle pads to the knee (Fig. 5).

Post-op Use

For post-operative ligament repair this orthosis comes with a standard polycentric hinge. When limited motion is desired (Fig. 6) the Lerman dial control knee hinge is used. This dial hinge provides extension and flexion control in any range (Fig. 1).

Measuring Techniques

A standard casting procedure is required for this custom made orthosis making sure that all landmarks are delineated and the center of the knee axis is established. A polycentric knee hinge is used because it comes closest to simulating the motion of the knee and provides more strength and torque stability than plastic hinges. The hinges also serve as an anchor for the floating condyle

Fig. 5

Fig. 6

pad system (Fig. 3). The femoral and tibial bands are constructed out of polypropylene which affords some flexibility, thus slight malalignment of the knee hinge can be tolerated. Further adjustments to the uprights to provide better fit can be made with less trouble than a knee orthosis with metal connecting bands. The bands are purposely placed posterior to prevent pressure on the tibia. The floating condyle pads are made of high density polyethylene, which is malleable. The strapping material is standard gum rubber with Velcro and elastic orthopedic webbing. All parts which are in contact with the skin are padded with a closed cell vinyl foam. This orthosis is commercially available, but can also be custom fabricated.*

* Available from the U.S. Manufacturing Company, Pasadena, California.

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