

Naomi Matsui, C.O.(c), Christa Orschel, M.Sc., Karen Strike, BKin Hons, MScPT

**Introduction** In the general population, custom orthoses or braces are often used to control pain by restricting or modifying joint motion. Specifically, relieving pain in weight bearing joints such as the knee and the ankle has a significant impact on the mobility of patients with hemophilic arthropathy. Custom orthoses were designed for this purpose, for two patients with severe hemophilia type A.

**The Process** A custom orthosis begins with a negative cast of the patient's limb, from which a positive cast is made [see figure 4]. The shape of the positive cast is modified to apply forces which re-position the limb or restrict its motion, as well as to relieve pressure on sensitive areas. High temperature thermoplastic is molded to the positive cast under vacuum. The orthosis is fitted to the patient's leg and appropriate straps and pads are attached.

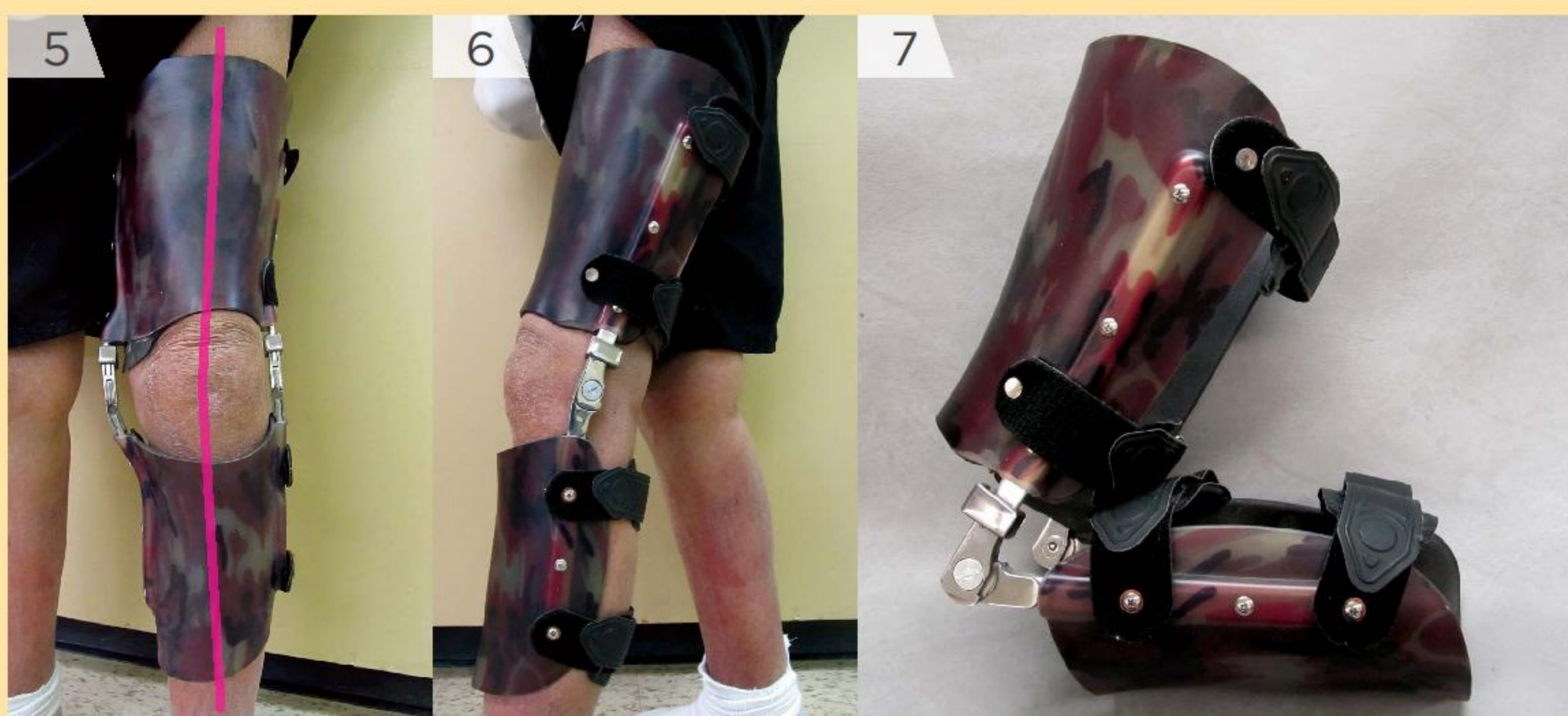


## Method [Two Case Studies]

**SUBJECT #1** is a 52 year old male with severe hemophilia A and severe arthropathy of both knee joints. The left knee demonstrates complete destruction of articular cartilage, severe osteoarthritis and osteophyte formation [figures 1 and 2]. The deterioration of the articular surfaces has caused a varus angulation, which causes pain in the medial compartment of the joint during walking and prolonged standing [figure 3]. A valgus force was applied manually to the knee joint during casting, which opened up the medial side of the knee. This restored knee alignment, and thereby reduced pain [figure 4].



The finished knee orthosis has polypropylene thigh and calf cuffs, linked by metal lockable knee hinges. It is suspended on the leg by strategic placement of pads and straps. The orthosis applies a three point pressure system to the leg, which keeps the knee joint out of varus angulation [figures 5-7]. **Subject #1 reports that wearing the device gives him prolonged pain relief.**



**SUBJECT #2** is a 25 year old male with hemophilic arthropathy of the right ankle, including cystic changes and osteophyte formation [figure 8]. Joint deterioration has affected both plantarflexion and dorsiflexion range, with the latter limited to +5 degrees. As he walks, tibial advancement beyond 90 degrees causes pain [figures 9 and 10].



This patient was casted for a custom hinged Ankle Foot Orthosis (AFO). The AFO is an anterior drape design, which allows free plantarflexion and provides a positive stop anteriorly, preventing dorsiflexion [figures 11 and 12]. An elastic strap was added to the dorsum of the ankle to maintain a neutral ankle position at rest [figure 13]. The AFO fits into a running shoe [figure 14].



**Subject #2 is free of ankle pain when wearing the AFO.**

**Conclusion** Two patients presented with advanced hemophilic arthropathy. Prior to bracing, both patients had significant pain with each step. Custom orthoses were designed for each of them, which maintained pain-free positioning. These are but two examples of patients with hemophilia whose joint pain has been managed with custom orthoses at Hamilton Health Sciences.

**Prophylactic use of orthotic devices can also limit range of motion in joints with a history of bleeds. Motion reduction may help to prevent or delay deterioration in weight bearing joints by reducing frequency of bleeds.**