

cast is more effective and actually causes less skin breakdown. A dropout cast, which can be used as part of the serial casting process, includes a cutout area, allowing movement of the joint in the desired direction. For example, for an elbow that has flexor hypertonicity, the dorsal upper arm portion of a long arm cast can be cut out to allow the triceps to be facilitated to extend the arm.

Serial casting should cease when desired position is achieved and tone is manageable with the last cast or splint. If there is no evidence of increased passive ROM after two to three casts are removed, serial casting must cease; however, the last cast should be kept, bivalved, and used as a "retainer" splint to prevent further contractures, similar to retainer use in orthodontics. Many innovations have occurred in commercially available spasticity reduction splints that are used to place the wrist and hand in inhibitive postures. The client and family need to be educated in continuing to incorporate the extremity in occupation, and to bear weight on the extremity as much as possible to retain the ROM gains achieved during casting.⁸⁷

Physical Agent Modalities

Physical agent modalities such as cold, superficial heat, ultrasound, and neuromuscular electrical stimulation can be used as preparation for or in conjunction with purposeful activity and muscle re-education, provided the therapist has the appropriate training and can prove competency. Ultrasound can help inhibit or reduce hypertonicity temporarily and increase tendon and muscle extensibility. It is helpful to provide concurrent stretch during the ultrasound procedure.⁸⁷ Neuromuscular electrical stimulation has been shown to strengthen paretic muscles.^{17,47}

Juan actually did gain strength and range of motion in his finger extensors with the help of neuromuscular electrical stimulation to the extensor digitorum communis muscle group, the extrinsic finger extensors. His intrinsic strength improved from 3-/5 to 4/5 within one month.

Distal to Proximal Approach

The *Functional Tone Management (FTM) Arm Training Program* was developed by Saobo Inc. to address the weaknesses of therapeutic interventions currently applied to the neurologically impaired upper extremity (UE) and hand. The occupational therapists that founded Saobo, theorized that because grasp and release capabilities are pivotal to UE integrating the UE into daily activities, a paradigm shift for UE neurological rehabilitation was needed. While traditional therapeutic interventions such as Bobath-based programs are based on a proximal to distal recovery pattern, Saobo developed their FTM Arm Training Program based on a distal activation model, focusing on the key point of early initiation of UE movements that incorporate grasp and release. In Saobo developed a dynamic orthosis for the hand, called the SaoboFlex (Figure 18-10).

The SaoboFlex orthosis assists an individual who exhibits hypertonia in the hand to place the hand in an open,



Figure 18-10 SaoboFlex dynamic orthosis. (Courtesy Saobo, Inc., Charlotte, NC)

functional position. This positioning is accomplished by means of a fixed wrist support and a variable strength finger and thumb spring system. Once the hand is open, the client can begin to retrain the finger flexors for improved motor control of the hand. While wearing the SaoboFlex, the client learns to produce a graded muscle contraction of the finger flexors in order to grasp an object. The finger and thumb spring system, coupled with the client's own efforts to relax muscle activation, allows the hand to open enough for the object held in the hand to be released.

Once the client is comfortable using the SaoboFlex, the FTM Arm Training Program can begin. The FTM program combines high repetition grasp and release with task-specific arm training drills to progress the client toward a functional goal. A significant body of research supports the FTM Arm Training Program;^{16,34,103} however, the program does not require the wrist or finger extension typically needed to participate in a constraint-induced program. Clinically observed improvements with the FTM Arm Training Program include increased AROM at the shoulder elbow and wrist, improved UE Fugl-Meyer scores, and decreased Modified Ashworth scores.³² Clients as far as 20 years post-insult have shown improvements. Independent research studies using the SaoboFlex and FTM Arm Training Program are underway.

Pharmacological Agents

Pharmacological agents prescribed and administered by physicians include oral medication, short-term nerve blocks, and long-term blocks.

Clients with severe hypertonicity accompanied by severe pain may need evaluation of the cause of the pain. Drug therapy and other pain management techniques may be part of the treatment approach. The four commonly used oral medications for spasticity of UMN origin are diazepam, baclofen, dantrolene sodium, and tizanidine. Dantrolene sodium acts

PEDRETTI'S

OCCUPATIONAL THERAPY

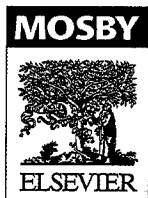
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