FITTING OF A TRANSCARPAL MYOELECTRIC HAND WITH A LOCKING LINER

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This is a case presentation of the fitting of a transcarpal myoelectric hand with a locking liner for a patient with a wrist disarticulation amputation.

Fitting patients with long upper extremity amputations has been a challenge in the past due to the resulting limb length discrepancy between the prosthetic and the sound sides. However, since the introduction of the new Otto Bock 8E44 Transcarpal myoelectric hand, it is now possible to fit wrist disarticulation amputees with a locking liner for suspension.

Patient history
JW is a fifty year old maintenance worker in a school board in a small town in Ontario. He has a wrist disarticulation amputation as a result of a wood chipper accident in September 2000. Since then he has been fit with a standard body powered conventional prosthesis.

JW was referred to West Park Health Care Centre early in 2002 to be fitted with an externally powered prosthesis.

Guiding principles
When an amputee who currently uses a prosthesis is referred to be fitted with a different prosthetic device, it is often very helpful to jot down the main improvements in function, comfort, cosmesis and any other features that are to be gained in the new device. The patient expressed the following wish list.

1. A prosthesis free of harness
2. Superior function in comparison to his conventional body powered prosthesis
3. Increased grip force
4. A prosthesis that looks like a real hand and one that is functional
5. A light weight prosthesis

Successful outcome is achieved when the gap between the patient’s expectations and the availability of current technology in devices fittings are clarified. For example clarification of bullet point 2, above, was discussed in great detail since the conventional prosthesis with a 5X hook could also be more appropriate as a tool in certain situations where the myoelectric device would be inappropriate.
Socket design
It was important for the patient to be free of prosthetic suspension harness and he wanted to maintain normal range of motion of the elbow. Since the Otto Bock 8E44 Transcarpal hand does not allow passive pronation and supination of the wrist, it was important that the socket design maintains the forearm rotation present in the residual limb. Patient’s bony distal end of stump with thin tissue coverage and low tolerance to pressure contraindicated for standard socket designs such as the expandable wall socket, partial silicone socket or socket designs with window openings. Supracondylar socket or the Munster socket would have restricted the natural pronation and supination of the forearm.

It was decided to use an Ossur Upper-X locking liner with an Icelock UX721 ratchet lock for suspension. An Ossur reusable fabrication tooling; UX 780 for the Icelock ratchet made it easy to set it up for trial fitting with a thermoplastic socket and save the ratchet lock for the fabrication of the definitive device.

Powered electric hand
Due to the use of the Ossur Upper-X locking liner and the Icelock ratchet locking mechanism, the selection of the hand had to be such that there was no arm length discrepancy between the prosthetic side and the contralateral sound side. The new Otto Bock 8E44 Transcarpal digital twin hand was recommended. The benefits of this prosthetic design are:

1. Symmetry of arm lengths achieved
2. Light weight in comparison to standard wrist disarticulation myoelectric hands.
3. Acceptable cosmesis

Conclusion
The use of the Otto Bock Transcarpal hand and Ossur Upper-X locking liner with an Icelock ratchet made it possible to achieve the primary objectives. Since the Otto Bock Transcarpal hand does not allow passive pronation and supination, it is essential to position the lamination plate to optimize pronation and supination for best functional usage of the prosthesis.

The length of the prosthetic device from the medial epicondyle of the elbow to the thumb tip of the Transcarpal hand was equal to the contralateral sound side. Comfort and cosmesis were improved and the patient did not think the total weight of the finished prosthesis was of any concern.