

FOREQUARTER AMPUTATION: SELF – SUSPENDING SHOULDER CAP

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For many years, suspension for most levels of upper limb prostheses was by web or nylon straps. Amputees looked upon these straps as a necessary evil but most longed for an alternative. In recent years, self-suspending sockets using either indirect skeletal attachment or suction/skin traction have been developed for trans-humeral and lower levels. Trans-radial levels are particularly suitable for self suspending sockets and at most enlightened prosthetic centres it now a rarity to come across harness suspended prostheses at this level. However, for higher levels, shoulder disarticulation and in particular forequarter amputation the residual stump shape does not lend itself to self-suspending methods.

Forequarter amputation involves complete removal of the arm and shoulder structure leaving an amputation site with little the prosthetist can utilise to assist in suspending the prosthesis. Additional difficulties arise, as no effective body power sources are available to operate prosthetic components. Externally powered components may be used but the additional weight of these components adds additional suspension problems. It can also be difficult to locate enough control sites to effectively operate these components. For these reasons unless extremely well motivated and determined most forequarter amputees resort to a lightweight shoulder cap prosthesis which extends to the axilla level. The sole purpose of this shoulder cap is to restore the patient's shoulder profile and improve their body image. However even this simple device requires suspension straps that extend around the shoulder on the sound side. Some amputees tolerate these straps but for others can be the major factor in rejecting the prosthesis. Comfort is a problem as is hygiene and especially for the female amputee, who may be wearing lighter clothing, it can be impossible to conceal the straps effectively under clothing. In addition, even with lightweight shoulder prosthesis it is often impossible due to the shear angle of the amputation site to prevent socket slippage. The socket may be extended around the base of the neck to the sound side in a halter shape but even this type of socket is not totally stable.

The idea for developing a completely different method of suspension for the forequarter shoulder cap came about after a discussion with Dave Allen of IDS Ltd, Dublin at the annual conference of the British Association of Prosthetists and Orthotists which is usually attended by around 1000 delegates. Dave had experimented with Amoena to assist the retention of a cosmetic partial shoulder restoration pad and found them to be very effective and thought that it might possibly to use the same material to suspend a complete forequarter shoulder cap.

Amoena pads are manufactured by the Coloplast Group for the attachment of breast prostheses. One side of the pad has a coating of medical grade adhesive and the other side loop Velcro.

Against this background and initial trial began at the National Centre's Prosthetic/Orthotic Clinical Unit at the West of Scotland Mobility and Rehabilitation Centre (WESTMARC), Southern General Orthopaedic Hospital, Glasgow.

The first patient fitted was a lady of 35 years of age who had an amputation two years previously as a result of a malignant soft tissue tumour. This lady had initially been provided with a lightweight laminated shoulder cap (fig 1&2) and a full endo-skeletal forequarter prosthesis (fig 3). She worked as a receptionist at a Health Centre and in the first few months would only leave her house if she were wearing her full prosthesis. As her self-confidence grew her preference was to wear the shoulder cap but still complained of the problems of socket slippage and discomfort from the simple retention straps.



Figure 1

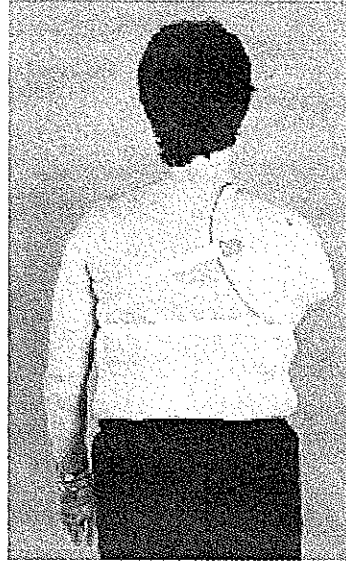


Figure 2

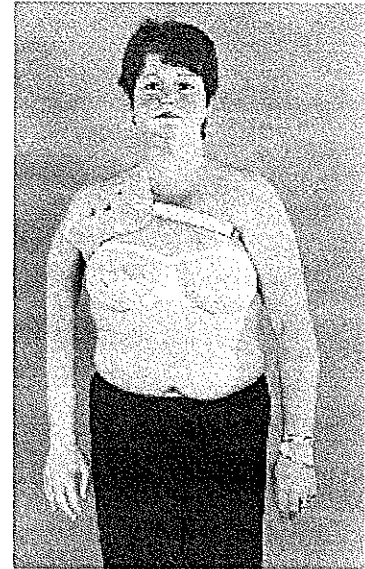


Figure 3

When approached to take part in the trial she was very willing and took the view that anything that might result in the demise of the straps was worth trying. Advice was taken from colleagues in mastectomy clinic at the hospital on the use of Amoena pads. The first stage was to check for any allergic reaction to the adhesive of the Amoena pads. A small patch was applied to the patient's skin and she was asked to check this regularly over a period of a week for adverse reaction. No problems were encountered and a cast was taken to begin a fitting. A shoulder cap was then produced using a custom mould and Otto Bock Pedilen Flexible Foam 150. To ensure a close fit inlays were moulded in to the foam to accommodate the thickness of the pads.

The method proved to be a success with the patient extremely happy with the immediate result. A review was carried out after one week and the patient arrived to report absolutely no problems. Retention was even better than had been anticipated, slippage was completely eliminated and the patient was enthusiastic about the improvement in comfort and cosmetic appearance without straps. She also felt the prosthesis to be lighter than previous models.

Initially we had been slightly concerned that adhesion of the pads (fig 4) might be a problem as the patient seemed to readily perspire. Our fears were unfounded as even with a daily shower the Amoena skin adhesive pads were staying in position for an average of four days before needing to be replaced. Since the initial fitting she has had a number of vacations to very hot countries without problems. It is now almost two years since this first fitting (fig 5) and the situation is unchanged, no skin problems have been encountered. The prosthesis is worn for an average of 15 hours every day.

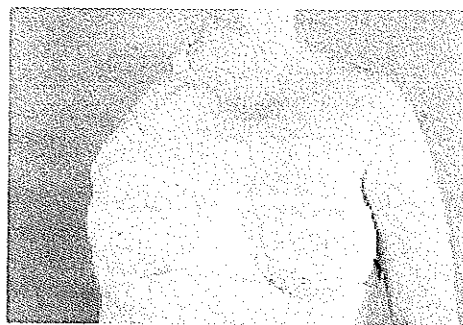


Figure 4

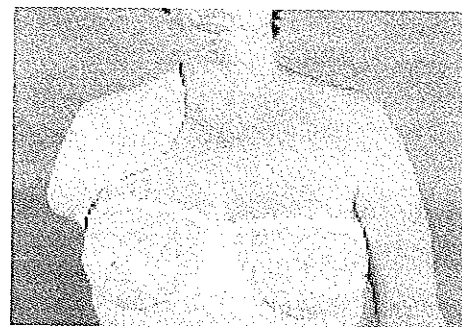


Figure 5

Since this initial trial a small number of additional fittings of shoulder caps have taken place all with the same success. We are currently looking at the possibility of using this method to suspend lightweight endoskeletal shoulder disarticulation prosthesis.

Although the overall numbers involved in this trial are relatively small the results so far show promise in improving the quality of life for a number of forequarter amputees and we have no hesitation in recommending the method to others.

Construction method

The main concern for many forequarter amputees is to have their shoulder profile accurately restored and for a number of years we have used the method of using the inverted shape of the sound side to make the mould. This method has proved to be extremely accurate and although more time consuming in the early stages than paper profile methods pays dividends at fitting stage as it is very rare that anything other than minor modifications are required to the shape of the shoulder profile.

A slab plaster cast is taken of the complete upper torso and from this casts of both sound and amputated sides are duplicated. Various plumb and reference lines are marked on the plaster cast before removal. The amputated side cast is modified in the usual manner and smoothed while the sound side cast is only smoothed. A thin laminate of two layers perlon stockinet and 100% flexible acrylic resin is then made over the sound side cast. When cured this is cut from the cast and trimmed. Next heat is applied to the laminate allowing the mould to be easily inverted thus taking on the profile of the missing shoulder and acting as an outer mould.

The modified amputated side cast is then covered with PVC under vacuum and the laminated shoulder former placed on the amputated side cast utilising the plumb and reference lines for accurate placement. The former is securely taped in position and filled with lightweight rigid polyurethane foam. When cured the foam is then fitted to the patient and any minor modifications required to give a perfect shoulder profile carried out. The next stage is to produce finished outer mould. For ease and speed this is thermoplastic draped using polypropylene.

PElite or any other suitable material is then shaped to the size selected for the Amoena suspension areas and adhered to the PVC covering of the amputated side cast to allow for the combined thickness of the Amoena pad plus a layer of hook velcro. Both the cast and outer polypropylene mould are then sprayed with a suitable release agent. The polypropylene outer mould is then accurately positioned over the cast taped and filled with Otto Bock Pedilen Flexible Foam 150 (fig 6). When cured the foam cap is removed from the mould and flash areas removed (fig 7). Hook Velcro is then glued onto the foam cap using a suitable adhesive.



Figure 6

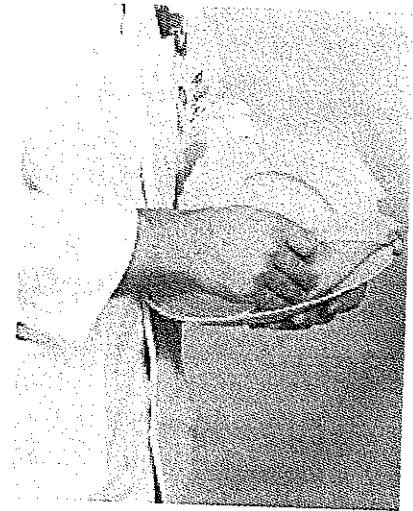


Figure 7

The most suitable method of positioning the shoulder cap on the patient is first to check the position without fitting the Amoena pads. If necessary light marks can be made on the skin to indicate the correct position using a suitable skin marker. The Amoena pads are then cut to shape and fitted to the Velcro in the shoulder cap but at this stage, the protective paper over the adhesive on the underside is left in place. The protective paper is then removed from the top pad and the shoulder cap placed in position on the patient. If the correct position is obtained the covers are removed from the other pads and pressed into contact with the skin.

Removal of the shoulder pad is achieved by placing a finger(s) between the skin and shoulder cap and gently easing the Velcro apart. If care is taken at this stage the skin Velcro will stay securely in place ready for the next application.