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Immediate Post-Operative Orthotic Impression Technique for Thermoplastic Spinal Orthoses Following Spinal Surgery

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Spinal surgery has been revolutionized in recent years by advances in surgical approaches, surgical techniques, and forms of internal fixation. Post-operative management has progressed from bed rest with log rolling, to mobilization in plaster casts, to modern technology orthoses. Co-polymer plastic composite orthoses have been used by the authors during the last few years. The orthoses have been easy to apply and have been comfortable for our patients. There have been no associated complications which would jeopardize the outcome of the operative procedure.

PATIENT SELECTION

The original patient the authors selected for management using a thermo-plastic orthosis was a retarded child with cerebral palsy who had previously been intolerant of casting, developing pressure sores within the cast. Molding for the co-polymer orthosis had to be done while the patient was anesthetized, since this patient was combative and otherwise difficult to work with. While the impression for this patient was being made, it became apparent that this molding technique would be easy to do in the operating room at the conclusion of operative spinal procedures. Initially, this post-operative molding technique was used for "special cases." These included patients with cerebral palsy, myelomeningocele, severe osteoporosis, and patients with severe respiratory problems. Eventually the older adult idiopathic population which seemed very intolerant of rigid metallic orthoses or casting was included. Things have gradually evolved to a point where most patients, other than teenage idiopathics, are candidates for this type of orthosis. The authors still prefer using a Kosair metallic axillary crutch style orthosis post-operatively for adolescent idiopathic scoliosis patients, since they seem to tolerate the rigidity of this system well.[1]

The first 80 patients fitted with the co-polymer postoperative spinal orthotic system are reviewed in this study.

Diagnoses include all the aforementioned, plus other types of muscular dystrophy, congenital scoliosis, tumors, post-menopausal deformities, and degenerative spinal deformities. All orthoses were applied after long (minimum of six vertebral levels) spinal fusions. All surgical cases, except those of congenital scoliosis, were routinely done with instrumentation.

ORTHOSIS IMPRESSION TECHNIQUE

The orthotic impression is taken immediately after the spinal surgery while the patient is still asleep. The technique is:

1. After the skin incision is closed, a light layer of Adaptic® and one layer of sterile four-by-fours are placed over the wound.
2. The skin is bilaterally marked longitudinally along the mid-axilla (mid-coronal line) using a wet indelible pencil. Perpendicular hash marks are randomly made across the mid-axillary line to be used as "key" reference marks later.
3. Sterile Vidrape® is placed across the patient's back to establish an impermeable membrane.
4. The Vidrape® is marked by superimposing onto it the marks made previously on the patient's skin.
5. Plaster splints are draped across the required area of the patient's torso, making sure that the plaster crosses the mid-axillary lines on both sides of the patient. The first layer is applied using two or three thicknesses of plaster. Subsequent reinforcing layers are applied, using about six layers of plaster. Finally, a few strips are applied to help prevent distortion of the mold. These are placed across the mold at two or three locations in the shape of an inverted "V."
6. At this point, the posterior section of the impression is removed from the patient when hard (Figure 1).
7. The Vidrape® is then removed in a manner which keeps plaster or water from touching the wound.
8. Sterile dressings are applied by the scrub nurse, who has remained sterile to this point.
9. The patient is placed on the post-operative bed that has been prepared using one extra sheet.
10. Vidrape® is then applied to the patient anteriorly in preparation for the anterior section molding. (Cover breast and groin areas with four-by-fours or diapers.)

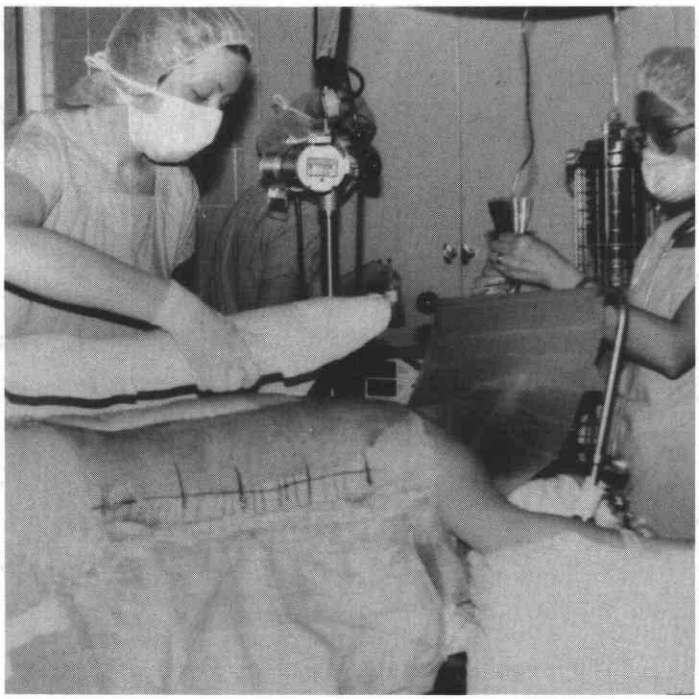

Figure 1. Orthotist removing posterior mold. Note Vidrape® and markings in mid-axillary line.

11. The indelible pencil marks are again superimposed onto the Vidrape® along the mid-axillary lines, and appropriate relief markings are made on the rib cage and iliac crests.
12. The anterior mold is made using the technique described in step five. When set, the plaster is removed.
13. Finally, the Vidrape® is carefully removed and the patient is ready to go to the post-operative recovery room.

After the impression has hardened sufficiently, a cast cutter may be used to cut along the mid-axillary indelible lines, visible on the inner surfaces of each half of the impression. Using the "key" hash marks established previously, the two impression halves are joined together with plaster strips. The impression is now ready for orthotic fabrication using the method of choice.

Since the impression has been made with the patient in the prone and supine positions, the orthotist must take this into account when fabricating the orthosis. The medial-lateral dimension of the patient is distorted normally about one inch due to the flattening effect created by the patient's weight against the operating and post-operative bed.

The time required for the impression procedure adds 15 to 20 minutes of extra anesthesia and operating room time. There have been no infections in any of these cases.

RESULTS

The orthosis described has been applied to 80 post-spinal surgery patients between January, 1980 and October, 1984. There were no cases of rod dislodgement or pseudoarthrosis. Fifty-eight patients had instrumentation done using segmental spinal wiring with either L-Rod or Harrington Rod fixation. One Mongoloid boy broke a wire in his L-Rod fixation, but over a subsequent 24 month follow-up, has shown no further wire or rod breakage. No other incident of internal fixation failure, while wearing the orthosis, has been encountered to date. Early in the series, one orthosis had to be remade due to pressure problems. No other orthosis has required anything except routine minimal corrections of trim lines. In the beginning, the average time of orthotic application was the eighth post-operative day. Later in the series, this dropped to the fifth post-operative day. Orthotic application varied from the second to the thirteenth day post-op and was determined by the patient's medical condition in all but one case. The patients were placed upright immediately upon application of the orthosis (Figure 2). They were dismissed from the hospital an average of four days after the orthosis was applied.

Orthoses were worn about six and one half months post-operatively (the first 25 patients wore theirs for eight months post-op; all subsequent patients have worn theirs for six months post-operatively).

Compliance has been monitored by the parents or guardians of the patients. They have reported 100 percent compliance. The parents are instructed that the orthosis may be removed when the patients are supine, for bathing, skin care, and pulmonary toilet as needed. Patients

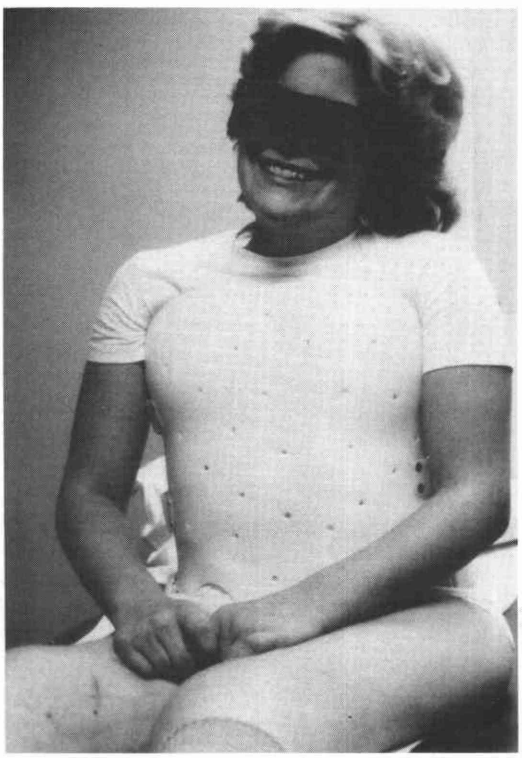

Figure 2. Post-op Spina Bifida child two days after brace application and four days post-operatively. Note colostomy site on right lower quadrant.

are never allowed up in the sitting position without wearing the orthosis during the six month post-operative period. One-half of the patients were non-ambulatory.

DISCUSSION

This is an easy, quick, and accurate way to measure and apply post-operative thermoplastic orthoses after spinal surgery. It has been possible to eliminate patient discomfort during the molding process and no manipulation of the patient was required during the procedure.

While this technique requires a close working relationship between physician, hospital personnel, and orthotist, it has virtually eliminated time delays in orthotic delivery. Historically, orthotic impressions were taken "when the patient was ready post-operatively." This left the impression making process in a nebulous time frame. Typically, patients were delayed in the application of their orthosis by a few days. This added additional patient time in the hospital with little benefit. Also, the orthotist had to schedule the impression making process at a time convenient to appropriate hospital personnel.

The technique described gives the orthotist and his/her staff adequate time to properly design and fabricate the orthosis. Although none of the patients were felt to be ready to ambulate or sit on the first post-operative day, it would be possible to apply the orthosis, if necessary, within 24 hours. Many of the severe respiratory cases (spinal muscular atrophy) are fitted with their orthoses, and sit up, while still on a respirator in intensive care. There was only one case where orthotic application delayed patient mobility (orthosis revision was necessary). Usually, comfort was the deciding factor in getting patients up. Later in this study group, when indications were broadened to include healthier patients, the time frame post-op of ambulation decreased significantly.

It is believed that molding for a spinal orthosis while the patient is awake, several days after surgery, is unnecessarily painful. It also places the patient in some jeopardy of dislodging the instrumentation while having the impression made. It is also considered irrational to mold patients for an orthosis at a time when they are actually ready to be up and around. The authors do not trust segmental spinal instrumentation without external bracing, and reports now indicate this conservative approach, including the use of an orthosis, in this group of patients is warranted.[2,3] Retarded children and patients with anesthetic skin easily get into trouble with body casts and non-removable orthoses. The orthotic system described certainly helps to alleviate many of the problems previously encountered with post-operative spinal orthoses. This technique is still not used for the standard adolescent idiopathic patient, who in our judgment currently does well with Harrington Instrumentation fixation and post-operative bracing using a rigid metallic Kosair type orthotic system.

ADVANTAGES

The co-polymer post-operative orthotic spinal system has many advantages:

1. Minimal patient discomfort;
2. Expedient spinal orthosis application;
3. Maximum utility for patient care (skin cleansing, checking anesthetic skin, respiratory therapy, etc.);
4. Taking an accurate impression with minimal post-operative movement of the patient; and
5. Excellent wearing compliance by patients.

DISADVANTAGES

While there are disadvantages to most anything, the negative points of this technique and system are few. They would include:

1. Increased anesthesia and operating room time (15–20 min.);
2. Tight post-op scheduling of the orthotist's time (Requires a close working relationship with physician, hospital personnel, and orthotist).

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