Expert's comment concerning Grand Rounds case entitled “Staged corrective surgery for complex adolescent kyphoscoliosis caused by back scalding during the childhood period” (by Hui-Ren Tao et al. doi:10.1007/s00586-012-2519-1)

Lawrence Scott Levin · Vincent Arlet

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The authors present a very complex case of severe spinal deformity following chest wall and flank scalding during childhood [1].

Little literature is available on this topic. Surgeons dealing with pediatric spinal deformities occasionally encounter such challenging cases.

The authors have reported a very rational discussion as to the options for surgical treatment. A team approach that includes a spine surgeon and a plastic and reconstructive specialist familiar with all methods of soft tissue coverage is of paramount importance.

This is the reason why in this Grand Rounds we asked two opinions: one from the spinal deformity world and the other one from the plastic/microvascular reconstruction world.

L. S. Levin
Paul D. Magnuson Professor of Orthopedic Surgery
(Professor of Plastic Surgery), University of Pennsylvania,
235 South 8th Street, Philadelphia, PA 19106, USA

V. Arlet (✉)
Professor of Orthopedic Surgery, University of Pennsylvania,
235 South 8th Street, Philadelphia, PA 19106, USA
e-mail: vincentarlet@aol.com

Spinal deformity surgery commentary

The authors chose a three-stage procedure:

- The first stage was an extensive soft tissue release of the scar tissue, and contracted tissue including the fascia followed by Halo femoral traction.
- The second stage was an anterior lateral thigh flap to cover the abdominal wall and torso. Halo femoral traction was continued.
- The third stage was the corrective spine surgery with pedicle screw instrumentation, multiple osteotomies and rod fixation.

If the patient had not had the contracted abdominal wall the other options could have been the following:

- Anterior release of the curve followed by posterior instrumentation performed in most cases in a second stage and often separated by Halo gravity traction.
- All pedicle screw instrumentation with soft tissue release and multiple Smith–Petersen osteotomies, but with the risk of having an insufficient correction.
- Vertebral column resection or decancellation at the apex of the curve.
- The issue as the authors pointed out is not to perform the most extraordinary spinal procedure (vertebral column resection), but rather to perform the safest procedure that the surgical team can perform. The surgical planning has to be coordinated with the plastic coverage requirement.

Vertebral column resection has now been reported to have a 30 % incidence of intraoperative changes of neuro-monitoring during surgery and 3 % of postoperative neurologic deficit [2, 3]. These numbers are probably underestimated.

The authors, therefore, chose an older, effective and safer way of correction, which is gradual traction over a period of time after soft tissue and or anterior release. This facilitates a safe monitoring of the neurologic status as well as the curve correction. This classic approach to spine deformity leads to a minimal rate of neurologic complication if performed adequately [4, 5]. This was coordinated with the plastic surgery resection and coverage of the abdominal wall. One question I have regarding the first anterior excision and release is to know the diaphragmatic status of the patient and whether it was feasible to release from the concave side of the curve some of the thoracic discs as it seems that the authors were in the retroperitoneal cavity at one point.

The result speaks for itself and I can only congratulate the authors for such a thoughtful process, patience, and dedicated and safe surgical care.

Plastic surgery commentary

The case in question is a 21-year-old male who was scalded by hot water when he was 10 years old. He developed a kyphoscoliosis, which developed rapidly, presumably on the basis of the cicatrix and scar tethering of the flank and thorax from contracture of skin, dermis, subcutaneous tissue, fascia and muscle adjacent to the spinal column. This mechanical tethering presumably led to the kyphoscoliosis that ultimately required the correction, which was described.

The case itself is a typical example of an “orthoplastic reconstruction”. Orthoplastic surgery has been popularized over the last 20 years. Orthoplastic surgery is the integration of principles and practices of the specialties of orthopedic surgery and plastic surgery applied to clinical problems simultaneously. This patient’s pathology resulted in a structural spinal axis problem, with bony deformity. As well, this represents a major soft tissue problem. The primary deforming force in this case was the tethering of the soft tissue. The concept of a staged spinal approach for safety is certainly appropriate, and I think it does merit the comment on the contributions of surgeons from China to reconstructive microsurgery. Free tissue transfer and microsurgery began in China beginning with replantation and revascularization procedures in the early 1960s. Subsequently, after being able to reattach amputated parts, surgeons learned to transfer tissue from one part of the body to another, so called autologous tissue transplantation. Coincidentally, the anterior lateral thigh flap was described by the Chinese, and has become the “work horse” soft tissue flap, particularly as it relates to vascularized skin transfer in the modern microsurgical world [6, 7]. Previous skin flaps such as the radial forearm flap, the scapular flap, and the groin flap are all microvascular tissue

transfers that can be performed, but do not provide the surface area that the anterior lateral thigh flap supplies. The entire thigh skin can be taken on one or two perforating vessels from the descending branch of the lateral femoral circumflex system. This flap has achieved tremendous popularity over the last decade and a half.

The authors should indicate that free tissue transfer is the highest rung on the reconstructive ladder of soft tissue reconstruction and clearly local flaps, additional skin grafts, and dermal substitutes would not have provided the well-vascularized and supple soft tissue required to complete this reconstructive surgery.

More importantly, there is currently the availability to actually expand flaps prior to transfer with tissue expanders. In order to avoid major donor site morbidity (which was not shown in the postoperative photographs), did the authors consider the use of tissue expansion of the anterior lateral thigh flap territory preoperatively?

In addition to free tissue transfer for the large soft tissue defect that presented after resection of scar, did the authors consider adjacent tissue expansion for other areas of the thorax, perhaps to decrease the donor site morbidity? (Resulting in the need for a smaller ALT flap?)

Also, the authors did not comment on where they performed the microvascular anastomoses. Often in cases that I have performed to the lumbar area that require large soft tissue flaps, such as in resection of chordoma or large massive exposure of spinal hardware from radiation, I have used arterial venous loops and long interposition vein grafts to make microsurgical anastomosis easy. I would assume that the scarring precluded the use of the intercostal vessels, but no mention was made of the donor vessels, which are important for preoperative planning.

Overall, I thought this was an outstanding combined effort between microsurgeons, presumably plastic surgeons and orthopedic spine surgeons. It certainly is a memorable protocol for unfortunate children, who are burned, as the authors described.

Conflict of interest None.

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