Frontalis Suspension in Congenital Ptosis using Lyodura®

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Lyodura® is a commercial name of a cleaned, desantigenized, desenzymatized, rendered free of pyogenics, sterilized by gamma rays, and lyophilized dura. Frontalis suspension with Lyodura® was performed on a total of 16 patients (21 lids) of congenital ptosis with levator muscle function of 3mm or less in the ptotic lid.

The follow-up period ranged from 2 to 39 weeks with a mean of 19.6 weeks. Postoperative lid levels were judged good, fair, and poor.

Good results occurred in 12 of 21 procedures (57.1%) and fair results in 6 of 21 procedures (28.6%). The summation of these two indicates an over all satisfactory result of 18 of 21 cases (85.7%).

Key words: Lyodura®, lyophilized dura, congenital ptosis, frontalis suspension.

INTRODUCTION

In congenital ptosis patients which have little levator function, frontalis suspension is a useful method of raising the upper eyelid. Materials which have been used for this purpose are widely variable and include fascia (both autogenous and homogenous), orbicularis muscle, preserved sclera, tendon, silicone, metal wires, and various nonabsorbable suture materials.1 Although autogenous fascia lata has proved to have a permanent effect, it is difficult to obtain in children below the age of 3.2 The profession has yet to reach on agreement as to which material is perfectly satisfactory.

The purpose of this report is to describe the use of preserved lyophilized human dura (Lyodura®) as a substitute for an autogenous fascia lata.

MATERIALS AND METHODS

A total of 16 patients (21 lids) with congenital ptosis and having levator muscle function of 3mm or less in the ptotic lid were admitted to the Seoul National University Children’s Hospital between November 1987 and August 1988. The preoperative examinations included the amount of ptosis, levator muscle function (excursion, Iliff test), Bell’s phenomenon and corneal sensitivity. A neostigmine test also was done when needed. When possible, surgery was deferred until an age, when better assessment of levator muscle function could be done. Surgery was done at an early age if the lid margin was compromising the visual axis. General anesthesia with endotracheal intubation was used in all instances.

A strip of preserved dura 10cm long and 3mm wide is obtained from the 4×10cm package containing 1 piece of Lyodura®. A 4-0 prolene suture was passed through each end of the strip, tied, and the needles were cut off. Before any lid incisions were made, the ptotic lid was elevated, and the lid contour was carefully evaluated to determine the best location for the lid margin incisions. Two short 3mm horizontal incisions were made through the skin and orbicularis muscle 3mm above the lid margin. Three similar incisions were made just above the eyebrow. The central incision of the three were placed, approx-
imately 5mm above a line connecting them. The skin of the central brow incision was undermined upward to provide a subcutaneous pocket for later use. A Reese ptosis knife was used to pass the Lyodura® sling strip through the subcutaneous structures, completing a pentagon. The two free ends of the strip were brought out at the central brow incision and were pulled up so that the lid margin lies slightly above the upper limbus with the eye in the primary position. The strip was then tied to itself, using 5-0 ethibond mattress sutures. The knot was anchored superiorly with 4-0 prolene beneath the central brow incision and buried into the subcutaneous pocket previously made. The three superior incisions were closed with 6-0 black silk. Antibiotic ointment was applied to the conjunctival cul-de-sac and the skin incisions. A modified Frost suture with 6-0 black silk was done, kept in place for 24 hours, and removed on postoperative 1st day.

In unilateral ptosis, the opposite normal lid underwent a Pang’s operation to eliminate the asymmetrical lagophthalmos and to create the symmetrical lid folds.4

On postoperative 1st day, patients were discharged with artificial tears and ointments. The brow skin sutures were removed on postoperative 5th day.

**RESULTS**

The above described method of frontalis suspension was performed in 21 lids for 16 patients. Twelve patients had unilateral ptosis and four had bilateral ptosis. The types of congenital ptosis were a simple type in 19 lids and complicated in 2 lids. Patients ranged in age from 1 to 6 years with a mean of 3.5 years, excluding one twelve-year-old patient. The followup period ranged from a minimum of 2 to 39 weeks with a mean of 19.6 weeks.

The criterion for a successful result was the postoperative lid level in relation to the superior limbus of the cornea. Lid levels were judged good, fair, and poor.2

Detailed patient data of this series are presented in the table 1.

<table>
<thead>
<tr>
<th>Cases</th>
<th>19 lids</th>
<th>2 lids</th>
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<tbody>
<tr>
<td>simple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>complicated*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age mean</td>
<td>3.5 yrs</td>
<td></td>
</tr>
<tr>
<td>Follow-up mean</td>
<td>19.6 wks</td>
<td></td>
</tr>
<tr>
<td>Results</td>
<td>good</td>
<td>12/21 (57.1%)</td>
</tr>
<tr>
<td></td>
<td>fair</td>
<td>6/21 (28.6%)</td>
</tr>
<tr>
<td></td>
<td>poor</td>
<td>3/21 (14.3%)</td>
</tr>
</tbody>
</table>

*: congenital III nerve palsies

(85.7%). Poor results were recorded in 3 of 21 procedures (14.3%).

Complications were localized infection and minimal exposure keratitis. One patient with bilateral ptosis in this series had an infection of the implanted material at the 6 weeks follow-up, and recurrent ptosis on both sides to a poor result level was gradually developed over the entire follow-up period (28 weeks). Minimal exposure keratitis occurred in two patients.

**DISCUSSION**

Lyodura® is a commercial name of human lyophilized dura, which is developed from dura mater cerebri by special processing.

Lyophilized dura was first used in neurosurgery by Sewell et al. who reported success in repairing dural defects in animals with homologous dural grafts. Thereafter, it was widely used in all fields of surgery, namely, neurosurgical, thoracic, orthopedic, abdominal, aural, orbital, oral, and genital surgery.513

The lyophilized dura is prepared in the following manner: obtained at autopsy, sterilized by immersion in ethylene oxide, then freeze-dried.67 Another sterilization method is gamma ray radiation.9

The structure of dura mater is mesh-like and non-direction-oriented. In the lyophilized state, this biological, but nonviable tissue is stiff and relatively brittle. When it is allowed to regain the liquid lost during lyophilization, it becomes flexible again and regains its toughness and firmness. Therefore, the dura should be moistened with physiologic saline solution before being sutured. However, it is not absolutely necessary to moisten the dura beforehand, since the dura becomes saturated with tissue fluids or blood within a short time.

In a histologic study of the fate of lyophilized dural grafts, Mason et al.5 reported an experi-
mental study in dogs which showed that the collagen fibers of the nonviable homologous dural graft undergo a process of swelling, degeneration and absorption at about 9 weeks after grafting when fibroblasts grow inward from the edges of the viable host dura. The growth took place initially on the inner surface of the graft and formed a well-organized collagenous fibrous sheet, microscopically similar to host dura but grossly thicker. Sharkey et al. reported that the implanted dura mater was increased 2 to 3 times in thickness 8 months after implantation and on microscopical examination was partially replaced by white fibrous tissue from the host and quite pliable in texture. There was no evidence of foreign body reaction or excessive scar formation found. Iannetti et al. reported a study of the fragments of lyophilized dura transplanted into the periosteum of a rabbit. The study showed that, a week later, a reactive process, similar to a delayed allergic reaction, was in process with the presence of eosinophil cells and that, four months later, the transplant was almost completely reabsorbed and replaced by fibrous tissue with evidence of non-specific chronic inflammation. Nothing was stated concerning the age of the dura donors.

The criteria judgement of a good, fair and poor result are as follows. A good result is defined as a postoperative lid level resting 2 to 3 mm below the superior corneal limbus without the use of the frontalis muscle in a bilateral case, or within 1 mm of the opposite normal lid in a unilateral case. A fair result is defined as a lid level in the same position as described above with the use of the frontalis muscle required to achieve this esthetically acceptable position. A poor result was defined as a postoperative lid level 4 mm or more below the superior corneal limbus even with maximal use of the frontalis muscle in a bilateral case, or 2 mm or more below the opposite normal lid in a unilateral case.

As to complications of frontalis sling surgery, unavoidable complications include ptosis in an upward gaze, lid lag in a downward gaze, lagophthalmos in sleep, arching and wrinkling of the brow and impedance of blinking and blinking. Also, avoidable complications comprise undercorrection, overcorrection, notching, lagophthalmos, recurrence, ectropion, exposure keratitis, chronic edema and infection. Indeed, unless unavoidable complications are produced, the operation is a failure. The avoidable complications of frontalis sling surgery are easily avoided with a little experience.

Several causes account for recurrence, which are untied suture knots, use of absorbable materials, trauma and too short a length of sling. The type of technic used has little effect on recurrence rate. Of the 21 surgical procedures presented in this study, 3 lids (14.3%) are categorized as recurrences. This result can be contrasted with a 5% recurrence rate with use of autogenous fascia lata, 3-8.3% with use of homologous fascia lata, and a no recurrence rate with use of the palmaris longus tendon. This is superior to a 29% and 40.5% recurrence rate with 4-0 Supramid Extra (4-0 polyfilament cable-type ophthalmic suture), or 14.3% and 50% with a scleral sling.

Exposure keratitis is not usual and years may pass without a case of exposure keratitis being seen following ptosis surgery. However once it occurs, it requires a long and careful nursing and protection of the cornea both day and night. Most cases, finally heal completely. Our patients were routinely prescribed for the instillation of artificial tears solution hourly and ointment at sleep. Of 21 cases, minimal exposure keratitis developed in two (9.5%), which are being carefully followed.

Acute primary infection is rare and the treatment is the same as for any infection. Unfortunately, it usually nullifies the operative procedure and makes reoperation difficult unless it is quickly controlled. Delayed secondary infection is more common. It may be low grade but is sometimes so persistent as to require removal of the sling. In this series, localized infection was present in one case (4.8%) at the postoperative, 6th week. After the infection had subsided, ptosis recurred.

Our experience indicates that Lyodura® may well have some usefulness as a temporary procedure and a longer follow-up period will be necessary to confirm it as a permanent alternative to fascia lata.

REFERENCES

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