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# PALMARIS LONGUS TENDON AS A NEW AUTOGENOUS MATERIAL FOR FRONTALIS SUSPENSION SURGERY IN ADULTS

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## SUMMARY

**We performed a prospective study using the palmaris longus tendon as the sling material to correct 8 consecutive ptotic eyelids in 7 adults. All operations were done with the patient under local anaesthesia by a single surgeon (D.S.C.L.). With a mean follow-up period of 14 months (range 2–20 months), all the ptotic eyelids were well corrected with no recurrence, intraoperative or post-operative complications. Use of the palmaris longus tendon as an alternative to fascia lata for sling surgery in adults is recommended.**

Frontalis suspension surgery is the procedure of choice for correcting severe ptosis with levator function of 4 mm or less.<sup>1</sup> However, we are still in search of the ideal sling material. Generally speaking, autogenous material is preferred to synthetic material for its lower rate of complications and recurrence of ptosis.<sup>2</sup> Although autogenous fascia lata remains the most popular and effective material for sling surgery, there are a number of disadvantages: general anaesthesia is required for harvesting, controversy exists regarding the best means of obtaining such tissue to minimise complications,<sup>3</sup> and it is not sufficiently developed for use before the age of 3 years.<sup>4</sup>

The use of tendons in frontalis suspension surgery has been described,<sup>5</sup> but widespread use is not common. The technical aspect and the possible complications are important deterrent factors. The palmaris longus tendon (PLT) is the donor material most commonly used for tendon and joint reconstruction by orthopaedic surgeons. It is reported to

be present in both arms in 70% and in one arm in 85%<sup>6</sup> of the population. The loss of the tendon produces no functional deficit. Its average length in an adult is about 15–16 cm.<sup>6–8</sup> This tendon is suited for use as a sling material for several reasons. Firstly, because of its superficial location and being relatively free from major surrounding structures along its course, it can be identified, isolated and harvested safely and easily. Secondly, it is thin enough to be placed easily and discreetly inside the eyelid. Thirdly, it is sufficiently strong, tough and wide<sup>8</sup> to allow splitting into two or more strips for providing more length if required. Harvesting of the PLT can be achieved easily and safely under local anaesthesia in adults because of its constant and superficial location.

We report here a prospective study of a series of 8 ptotic eyelids in 7 consecutive patients who underwent corrective ptosis surgery with the PLT as the sling material. To the best of our knowledge, this is the first reported series of cases that uses PLT as the sling material.

## MATERIALS AND METHODS

### *Subjects*

From May 1993 onwards, 7 consecutive cases of congenital ptosis from the Prince of Wales Hospital were recruited for surgery. A pre-operative complete eye examination including full-face photography was performed for all patients. All patients had normal corneal sensation and Bell's phenomenon. The degree of ptosis was documented by measuring the palpebral apertures in primary gaze while restraining the action of the frontalis muscle. All patients had less than 4 mm of levator muscle action in the affected eyelids. With informed consent, all operations were done with the patient under local anaesthesia by a single surgeon (D.S.C.L.). Harvesting of the PLT was done together with the orthopaedic surgeons for the first 4 cases; in the remaining cases it was done by D.S.C.L. alone.

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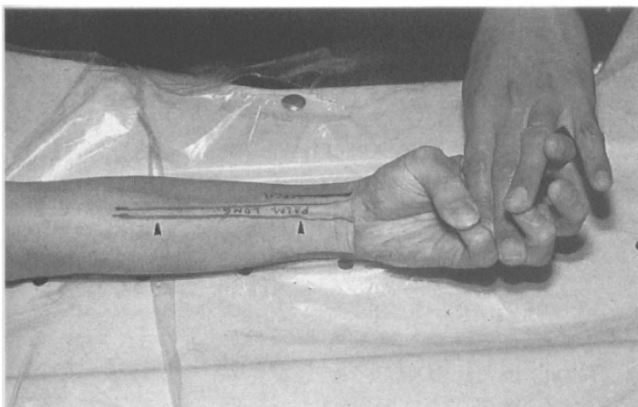
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### Tendon Harvesting

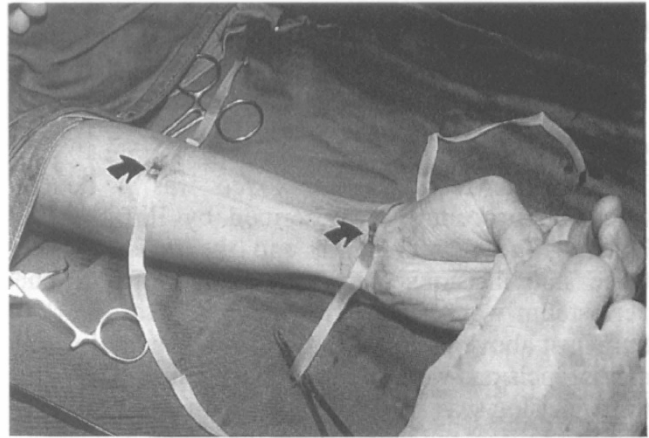
The method for harvesting the PLT was based on a modification of Saeed and Kay's technique.<sup>9</sup> The PLT was made to stand out prominently by asking the patient to oppose the tip of the thumb and little finger while flexing the wrist against resistance.<sup>8</sup> The whole course of the PLT was then marked with a standard non-erasable skin marking pen (Fig. 1).

With the patient supine and the forearm resting supinated on the arm table, the upper limb was cleaned and draped to expose the skin to above the elbow. A pressure bandage was applied from the wrist to the elbow after the upper limb had been raised to about 30 cm above the table for 1 minute. The pressure bandage was removed after a tourniquet had been put in place over the area just below the elbow. This provided the surgeon with a bloodless field.

A total of about 2 ml of 2% lignocaine with adrenaline was injected in the subcutaneous plane over the planned incision sites, namely near the distal end (over the proximal wrist flexion crease) and about 12 cm from the end of the PLT. A transverse incision of about 1 cm, down to the subcutaneous plane, was then made directly over the distal PLT over the proximal wrist flexion crease. After incising and separating both the superficial and deep fascia, the very superficial location of the PLT ensured that it was in view easily. The paratenon was incised and the tendon isolated and set free with a mosquito forceps. A 4-0 Ethibond traction suture was put up and secured at the distal end of the tendon. Traction on the tendon in an upward and distal direction helped to delineate and confirm the course of the tendon and allowed palpation of its proximal end in the mid-forearm. Under palpation and direct vision, a similar 1 cm transverse incision was made approximately 12 cm from the distal end of the tendon. The proximal tendon was isolated from the surrounding muscles and connective tissues in a similar way as for the distal tendon. Confirmation of



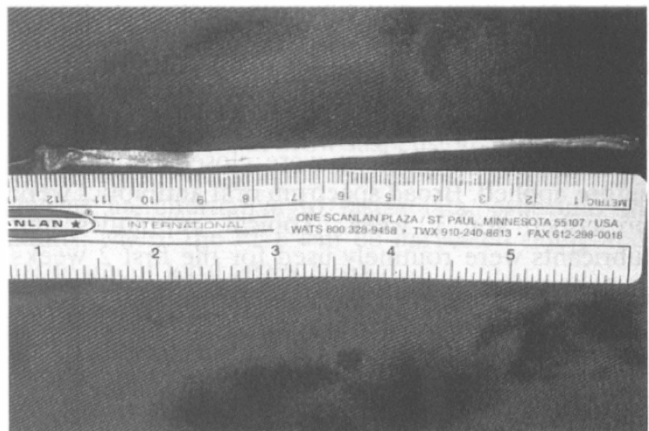
**Fig. 1.** Marking the palmaris longus tendon (see arrow-heads).



**Fig. 2.** Palmaris longus tendon at the two incision sites (see arrows).

the tendon was easily made by pulling the stay suture at the distal end: movement of the proximal end is visible while the distal end is being pulled. The tendon was isolated and tied after the paratenon had been incised (Fig. 2). The tendon was further separated from the paratenon with the spreading action of a mosquito forceps applied longitudinally at the two ends of the tendon. The tendon was further mobilised by pulling the stay sutures at the two ends. The distal end was then cut close to its insertion. Retrieval was made by pulling the tendon from the proximal end. Once the distal end of the tendon came out of the proximal incision site, the proximal end was cut while the tendon was being pulled distally.

The dimensions of the tendon harvested (Fig. 3) were in the range of about 12–15 cm (length)  $\times$  2–3 mm (thickness)  $\times$  5–8 mm (width). The tendon as such would be too bulky for use. It was then sliced into two to four strips depending on whether bilateral or unilateral surgery was contemplated. After splitting, the tendon strips were soaked in dilute gentamicin solution (40 mg/100 ml) for 1 minute and then wrapped with wet gauze ready for



**Fig. 3.** Freshly harvested palmaris longus tendon.

use. In all cases, including patient 3 who had bilateral surgery, one tendon was sufficient.

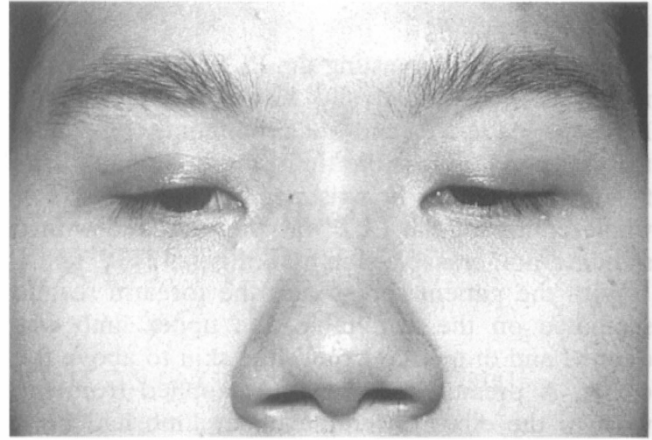
### *Brow Suspension*

The surgical technique employed was a double trapezoid procedure as described by Iliff.<sup>10</sup> After blocking the frontal nerve and the incision sites, three stab incisions 2 mm long and down to the periosteum were made with a no. 15 Bard-Parker knife just above the cilia of the brow. The lateral and medial incisions were made above each canthus; the third incision was in the centre. With a lid plate in place to protect the globe, three further stab incisions 2 mm long and down to the tarsal plate were made 2 mm above the lashes. The nasal and temporal incisions were 6 mm from the canthi; the third was placed centrally.

An empty Wright's fascial needle was inserted through the middle brow incision down to the periosteum. It was angled around the orbital rim to perforate the orbital septum and then passed inferiorly, anterior to the tarsal plate, to emerge through the central lid incision. The PLT was threaded through the eyelet of the needle and the centre of the strip was withdrawn through the incision to emerge from the brow. The Wright's needle was then inserted from the temporal to the centre lid incision, and the PLT was drawn laterally. The needle was then passed from the supero-temporal incision to the temporal lid incision to draw the PLT superiorly. Finally the PLT was drawn from the central to the lateral brow incision so that both ends of the sling emerged from that incision. The nasal PLT was threaded in a similar manner so that the ends emerged from the medial brow incision. The ends of the two PLT on the temporal side were pulled tight until the lid rested just above the superior limbus. It was then tied with two 5.0 Ethibond sutures passed through the PLT just within the brow incision. The ends on the nasal side were tightened and tied in a similar fashion. The excess PLT was trimmed and the sling allowed to retract back into the deep brow space. Pulling from the lid margin with a blunt-tooth forceps helped to ensure adequate retraction of the PLT into the deep brow tissue and reduced the possibility of extrusion of the PLT. The brow incisions were closed and a Frost suture applied. Broad spectrum oral antibiotics were prescribed for 1 week. Topical antibiotics and lubricants were routinely used for the first 2 weeks and subsequently as required.

## RESULTS

Eight ptotic eyelids in 7 consecutive adult patients with a mean age of 27 years (age range 18–43 years) underwent frontalis suspension with the PLT. Surgi-



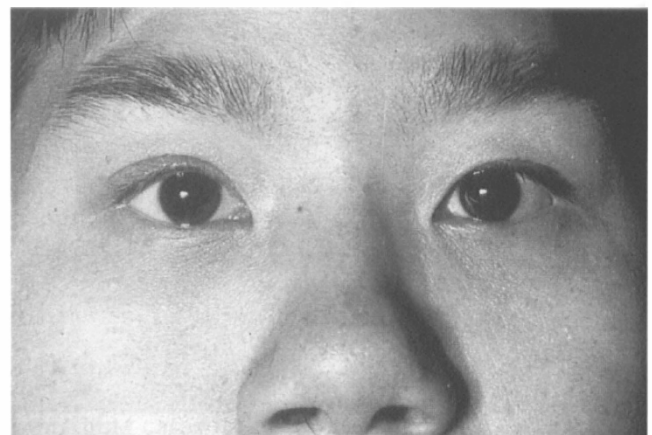
**Fig. 4.** Patient 3 with bilateral congenital ptosis pre-operatively.

cal outcome was judged as either good, moderate or poor. The criteria were as follows:

1. *Good*: the post-operative lid position was maintained within 1 mm of the superior limbus.
2. *Moderate*: the post-operative lid position dropped more than 1 mm below the superior limbus but remained clear of the visual axis.
3. *Poor*: the post-operative lid position dropped to obscure the visual axis.

The results on the seven patients are shown in Table I. With a mean follow-up period of 14 months (range 2–20 months), all patients had a good result with the lid position remaining within 1 mm of the superior limbus (Figs. 4, 5).

The harvesting of the PLT took about 20–30 minutes. No pain or discomfort was experienced by the patients. There were no cases of recurrence, operative complications, or post-operative complications such as wound infection, stitch granuloma, fistula or extrusion of the tendon in the follow-up period. No neurological deficit or loss of hand, wrist or forearm function was detected. Moreover, all patients were well satisfied with the cosmetic aspect



**Fig. 5.** Patient 3 post-operatively.

**Table I.** Results of brow suspension with the palmaris longus tendon sling

Patient no.	Side	Age at surgery (years)	Ptosis (mm below limbus)	Follow-up time (months)	Result
1	Left	26	5	20	Good
2	Left	29	5	20	Good
3 <sup>a</sup>	Right	26	5	17	Good
3 <sup>a</sup>	Left	26	6	17	Good
4	Left	43	4	17	Good
5	Left	18	5	15	Good
6	Right	20	4	2	Good
7	Right	25	5	2	Good

<sup>a</sup>Patient 3 received brow suspension surgery in both eyes.

related to harvesting of the tendon because the scars over the incision sites were very small and inconspicuous.

### DISCUSSION

Although there are many materials (synthetic, fresh and autogenous, or banked lyophilised human fascia lata) available for brow suspension surgery, freshly harvested autogenous fascia lata is still preferred because of its long-lasting effect and relative freedom from complications. Banked lyophilised human fascia lata was once advocated. However, Wilson and Johnson<sup>11</sup> found that there was a significant rate of late recurrence of ptosis in patients using this material. In their study, with a mean follow-up of 7.2 years, there was an increasing number of failures with increasing length of follow-up, the success rate of surgery falling from 90% at 2–3 years to 50% at 8–9 years. In addition, many parents feel that the use of donor material in their children is unacceptable because of the potential risk of cross-infection.

Autogenous fascia lata has been used most frequently for brow suspension, but it has its own problems. General anaesthesia is invariably required for harvesting and controversy exists on the best means of obtaining such tissue to minimise complications. Percutaneous fascia lata harvesting may be complicated by vastus lateralis herniation, a well-known complication. It requires open surgery to avoid this complication, which defeats the purpose of percutaneous harvesting. These factors, along with the lack of availability of suitable tissue in children under the age of 3 years, have been major drawbacks.

The PLT, like other tendons, consists of dense and regularly arranged connective tissue. It possesses greater tensile strength than fascia, which is made up of dense but irregularly arranged connective tissue. PLT is thin and cable like, and can be threaded into the eyelet of the Wright's fascial needle easily. It glides smoothly through the tissue, which helps to minimise surgical trauma and post-operative inflammation.

Regarding harvesting of the PLT, it is most important to assess the patient pre-operatively to ensure the presence and suitability of the donor tendon. One must rule out those individuals

(15–25%) in whom the PLT is congenitally absent.<sup>7,8</sup> Vastamaki<sup>12</sup> reported 4 cases between 1970 and 1984 of the median nerve being mistaken for the PLT and harvested for a free tendon graft. In all cases, reconstruction of the median nerve was performed with a free sural nerve graft. The problem was that the palmaris longus tendon was missing in all these cases. Saeed and Kay<sup>9</sup> reported recently that in their series of over 30 cases of PLT harvesting there was no morbidity. They concluded that the theoretical risk of damage to adjacent structures, in particular the median nerve, was not borne out in practice if one ensures that the PLT is present pre-operatively and the necessary steps and precautions are observed. We encountered no difficulty in harvesting the PLT under local anaesthesia in adults. In fact, it is easier and safer to harvest under local anaesthesia because the tendon stands out prominently when the patient is asked to oppose the tip of the thumb and little finger and to flex the wrist actively during the operation. The risk of permanently damaging neural tissue is especially low under local anaesthesia, as a warning signal in terms of abnormal sensation will arise if nerve tissue is touched or stimulated. In addition, the time required to harvest the PLT is only 20–30 minutes, which compares very favourably with that of harvesting the fascia lata.

Furthermore, tendons are completely developed at birth and may be obtainable in adequate lengths in all age groups. It is not infrequent for orthopaedic surgeons to perform tendon repair or transfer procedures for infants and children. It may be possible for autogenous PLT to be used as the sling material for ptosis correction for young children before adequate development of fascia lata. Although we have yet to evaluate the long-term efficacy of the PLT in brow suspension, the mid-term results are so encouraging that we would recommend this as an alternative to fascia lata, especially in adults, where the PLT can be harvested safely and easily under local anaesthesia.

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Key words: Brow suspension, Palmaris longus tendon, Ptosis.

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