EXTENDED REPORT

The use of porous polyethylene (Medpor) lower eyelid spacers in lid heightening and stabilisation

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Br J Ophthalmol 2004;88:1197–1200. doi: 10.1136/bjo.2003.029397

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Accepted for publication
14 January 2004

Background/aims: The management of lower eyelid retraction can be challenging, and established techniques to correct it are not always successful. Previous reports have suggested a role for the ultrathin high density porous polyethylene lower eyelid spacer (Medpor LES) in such patients. The authors report the experience of three surgeons implanting Medpor LES over 1 year, and ascertain whether such implants are a safe and effective alternative to autogenous spacers.

Methods: A prospective, interventional, non-comparative case series of consecutive patients. Surgical indications for Medpor LES were noted. Preoperative and postoperative lower marginal reflex distance (L-MRD), vertical palpebral aperture (PA), lagophthalmos, and scleral show inferior to the limbus (LSS) were recorded, together with major and minor complications.

Results: 32 patients (35 eyelids) had a Medpor LES inserted, 22/32 under local anaesthetic, and nine with adjunctive procedures. Mean follow up was 22 months (range 15–28 months). The Medpor LES was effective in reducing the palpebral aperture ($p < 0.001$) and lagophthalmos ($p = 0.04$) and raising the lower eyelid height by reducing both L-MRD ($p = 0.006$) and LSS ($p < 0.001$). However there were major complications in 7/32 patients and minor complications in 8/32, most requiring further surgery. Final outcome was good in 24/35 eyelids and satisfactory in 5/35.

Conclusions: Despite a good or satisfactory final outcome in the majority of patients, the value of this technique is limited by complications, and should be reserved for those unsuitable for safer techniques.

High density porous polyethylene is a biointegratable implant material^{1–5} for use in lower eyelid retraction as an ultrathin lower eyelid spacer (Medpor LES).^{6–8}

Lower eyelid retraction occurs commonly in Graves' ophthalmopathy and facial palsy, secondary to surgery, trauma or cicatrization, or in post-enucleation socket syndrome (PESS). It is challenging to correct, and requires either retractor recession^{9–10} or use of a spacer^{11–16} to support the eyelid. All spacers have potential disadvantages: sclera¹¹ carries a risk of transmissible encephalopathies, while autogenous grafts^{12–15} have potential donor site morbidity plus time and anaesthetic considerations. Materials such as Mersilene mesh¹⁶ are not rigid enough to provide much support; however, a stiffer alternative is high density porous polyethylene.^{1–5} The Medpor LES is 0.45 mm thick and measures 27×16 mm, shaped for each lower eyelid (Porex Surgical Inc).^{6–7}

This study aimed to report the authors' experiences with implantation of the Medpor LES. We sought to determine the indications, efficacy, and complications of Medpor LES, and thereby ascertain whether they were a safe and effective alternative to autogenous spacers in such patients.

PATIENTS AND METHODS

All patients, under the care of three surgeons in two centres, who were implanted with a Medpor LES over a period of a year were included. Minimum follow up was 15 months.

The patients' age, sex, condition, and indication for lower eyelid implant were recorded. Preoperative and postoperative measurements including lower marginal reflex distance (L-MRD), vertical palpebral aperture (PA), lagophthalmos, and scleral show inferior to the limbus (LSS) were recorded where appropriate. Most patients received postoperative systemic antibiotics. Complications were recorded as major or minor: major complications comprised infection, exposure, or any reason for implant

removal, while minor complications were either transient, or required a further procedure to correct a minor lid abnormality.

Preoperative and postoperative measurements were compared non-parametrically using Wilcoxon matched pairs signed rank test. Where patients had surgery to both lower eyelids, the statistics presented relate only to the first operated eye, and therefore to 32 eyelids. Where otherwise appropriate, information on all 35 eyelids is given.

Surgical technique (fig 1)

The Medpor LES was inserted via a subciliary skin orbicularis incision. A pocket was created in the middle lamella. The septum was left intact in patients who required rigid elevation, with its lower edge on the anterior inferior orbital rim. For other patients the septum was incised inferiorly, allowing the implant to slip behind the orbital rim on downgaze, thus retaining eyelid motility.

The implant was trimmed to size with the help of a template. Bending to overexaggerate the preformed curvature helped reduce lateral or medial winging. Twenty four of the 35 implants were presoaked in gentamicin (125 mg in 5 ml saline) and skin contact during insertion was avoided.

The upper implant edge was sutured firmly to the lower tarsal border, using interrupted 6/0 polyglactin sutures. Orbicularis was closed meticulously with 6/0 polyglactin before skin closure.

RESULTS

There were 32 patients (35 eyelids), 12 female and 20 male, with a mean age of 57 years (range 26–87 years). Twenty nine patients underwent unilateral implantation; three had

Abbreviations: LES, lower eyelid spacer; L-MRD, lower marginal reflex distance; LSS, scleral show inferior to the limbus; PA, palpebral aperture; PESS, post-enucleation socket syndrome

Figure 1 Inserting the Medpor LES. (A) Transcutaneous incision. The lower orbital septum is opened to allow posterior slippage of the LES inferiorly. (B) Trimming inferior and medial LES edges. (C) LES curved to fit lower eyelid and placed in middle lamella. (D) LES sutured to tarsus at upper edge. In this patient with facial palsy the orbital septum was deliberately left intact.

bilateral surgery. Surgery was performed under local anaesthesia in 22/32 (69%) patients, while 8/32 (31%) chose general anaesthesia. The mean postoperative follow up was 22 months (range 15–28 months).

Main surgical indications were facial palsy ($n = 12$), Graves' orbitopathy ($n = 10$), ocular prosthesis instability ($n = 7$); others included myotonia, maxillectomy with radiotherapy, and cicatricial chemical burn ($n = 6$). Most of the patients in the facial palsy and ocular prosthetic instability group had had previous procedures, while two patients with Graves' orbitopathy had had donor sclera and hard palate spacers to correct the lower lid retraction. Insertion of the implant was done with adjunctive lower eyelid procedures in 9/32 patients (28%).

Table 1 summarises the preoperative and postoperative eyelid measurements in first eyelids of patients whose primary aim was lower eyelid elevation. The implant was effective in reducing palpebral aperture ($p < 0.001$) and lagophthalmos ($p = 0.04$), and in elevating the lower eyelid as measured by L-MRD ($p = 0.006$) and LSS ($p < 0.001$). This effect was retained over follow up of at least 15 months in 28/32 (87%) patients; however, seven of these required revision as detailed below.

There was a high level of patient acceptability, with only two patients requesting removal, one for discomfort and one for poor lid motility in downgaze.

Exposure symptoms and lubricant requirements fell promptly in all patients in the facial palsy group. Five patients with Graves' orbitopathy and unilateral implantation achieved symmetry to within 0.5 mm of the contralateral eyelid. In anophthalmic patients the prosthesis was stabilised in six, five with a good lid position.

Complications (table 2)

There were major complications in 7/32 patients (22%). Implant exposure occurred in five eyelids of 4/32 patients (13%) within 16 weeks, but only three exposed implants required removal; the remaining two were trimmed and remain satisfactory after a further 12 months. All implants exposed through the skin.

The other three major complications leading to implant removal were unexplained pain, poor eyelid mobility on downgaze, and outward rotation of the upper implant margin on downgaze. The latter implant was exchanged for a smaller one. Hence, implant removal or exchange was necessary in six eyelids of five patients (16% of patients).

Minor complications occurred in nine eyelids of 8/32 patients (25%), but most required a second surgical procedure (table 2). These comprised transient lash loss, skin contour abnormalities with lateral or medial winging or a superior edge ridge (fig 2), or lid margin ectropion as a result of unrecognised coexistent horizontal laxity. Six

Table 1 Preoperative and 1 year postoperative measurements (in millimetres)

	Preoperative	Postoperative	p Value	Difference in medians (95% CI)
	Median (range)	Median (range)		
L-MRD ($n = 15$)	7 (5–10)	6 (3–8)	0.006	1 (0.75 to 2)
Vertical PA ($n = 22$)	10.5 (5–15)	9 (4–13)	<0.001	1.5 (1 to 2.5)
Lagophthalmos ($n = 21$)	3 (1–9)	2 (0–8)	0.04	1 (0 to 1.5)
LSS ($n = 18$)	2 (0–5)	1 (–0.5–4)	<0.001	1 (1 to 2)

Data derived from 32 patients: where bilateral surgery performed, only first eye data included.
L-MRD, lower marginal reflex distance; LSS, scleral show inferior to the limbus; PA, palpebral aperture.
Statistics: non-parametric, Wilcoxon matched pairs signed rank test.

Table 2 Complications of Medpor LES				
Aetiology	Overall complication rate	Major complications	Minor complications	Final outcome of eyelids where implant retained
All eyelids (n = 35)	17/35 (49%) eyelids	8/35 (23%) eyelids	9/35 (26%) eyelids	n = 29 Good: 83% Satisfactory: 17% 9/10 good 1/10 satisfactory
Facial palsy (n = 12)	4 (33%)	2/12 (16%) 1 removed for pain; 1 extruded	2/12 (16%) 1 lid tightening, 1 declined revision	4/10 (40%) 8/9 good, 4 after revision 1/9, lost to follow up after 15 months
Graves' orbitopathy (n = 10)	6 (60%)	2/10 (20%) 1 removed (poor motility); 1 exchange (superior edge ridge)	1 margin ectropion; 2 superior edge ridge (1 patient); 1 transient lash loss	3/7 (43%) 4/6 good, 1 after revision 2/6 satisfactory; 1 revised, 1 declined revision
Ocular prosthesis instability (n = 7)	3/7 (43%)	1/7 (14%) Removed after exposure	All superior edge ridge	1/3 good 2/3 satisfactory, both revised 1/1 good without further surgery
Myotonic/muscular dystrophy (n = 3)	2/3 (66%)	2/3 (66%) exposed: Both revised (same patient)	0/3	1/2 (50%) 1 removed
Maxillectomy with radiotherapy (n = 2)	1/2 (50%)	1/2 (50%) 1 removed	0/2	0/1
Chemical injury to eyelids (n = 1)	0 (0%)	0/1	0/1	1/1 good

patients underwent a further minor procedure and were followed uneventfully for >10 months, while two were satisfied without further intervention. Further minor procedures included implant trimming with resuturing to the tarsus and repair of the septum to stabilise the implant more vertically; both without implant removal.

Some patients noticed reduced eyelid motility in downgaze, which improved with time. This reduced motility was beneficial in exposed eyes, improving tear film distribution and ocular protection.

Final outcome was judged to be good if the implant had significantly addressed the surgery indication to the patients' and doctors' satisfaction, and with good aesthetic outcome. Definite but lesser improvement was deemed satisfactory. By this measure, outcome was good in 69% eyelids (24/35), satisfactory in 14% (5/35), and poor in 14% with implant removal.

DISCUSSION

To date, this is the largest series reporting implantation of Medpor LES outside the centre of origin of this technique,⁷ and as such, its findings are very important. It provides a second independent report of the use of this implant,⁸ in this instance with a minimum follow up of 15 months.

Seventeen out of 32 patients (53%) in this series had a good result without further revision, while 2/32 had a satisfactory result. Following revisions, the final results at 15–28 months showed 84% of patients to have a good or satisfactory outcome, effectively raising or stabilising the lower eyelid. We do however report significantly more complications than Wong *et al.*,⁷ who reported from the centre of origin, or Toledano Fernandez *et al.*⁸ In contrast, Thierry Malet (Clinique Monticelli, Marseilles, unpublished communication) noted that >50% eyelids required implant removal.

As this study progressed, the critical importance of implant placement, sizing, curving, and attachment became apparent. Secure attachment to the inferior tarsal border is essential to inhibit any tendency to upward slippage. Additionally, we now follow the recommendation to place the superior edge of the implant under a flap of pretarsal orbicularis to reduce the risk of subciliary exposure.⁷

Indications for implantation were similar to previous reports,^{6–8} excepting those with prosthetic instability, not previously reported. As with other series, the largest subgroup had facial palsy, of whom 75% had a good final outcome and significant reduction in lagophthalmos. These patients also had the highest rate of previous procedures which had failed to prevent recurrent keratopathy. The Medpor LES has sufficient rigidity to support the lower lid against gravity when orbicularis function is poor. The lower eyelid is stented upwards by the intact septum, thus protecting the inferior cornea.

Lower eyelid retraction in Graves' orbitopathy almost always relates to proptosis. Decompression should therefore be considered first, with lower lid elevation if later indicated or in those who decline decompression. In this series, problems in downgaze led to implant removal in one patient, exchange in another, and skin contour abnormalities in two. With this high rate of complications, the authors therefore suggest that the Medpor LES is only indicated for Graves' orbitopathy patients in whom hard palate or auricular cartilage grafts are unacceptable or have failed.

Figure 2 Left lower eyelid retraction in Graves' orbitopathy. (A) Preoperative. (B) One year postoperative left lower lid Medpor LES. Improved height but unsatisfactory contour; subsequently exchanged for smaller LES.

In patients with PESS where downgaze motility is not an issue, the implant should be placed entirely anterior to the intact orbital septum, preventing outward rotation of the implant by the weight of the prosthesis. The implant provides prosthesis stability and improved lower lid symmetry, and is less likely to stretch than a lateral canthal sling.

The patients with the poorest outcome were the small group with myotonic dystrophy. Potentially adverse contributory factors include thin anterior lamellar tissue, poor muscle tone, and chronic lid margin disease, and the authors feel that this technique is relatively contraindicated in such patients

In this series the implant was eventually effective in most patients, with a significant reduction in palpebral aperture and lower marginal reflex distance. Advantages include a lack of donor site morbidity and donor material risks, plus anaesthetic and surgical time considerations. The disadvantages are the high rate of revision procedures. It is the authors' opinion that the usefulness of this technique remains limited, and should be restricted to those unsuitable for safer techniques such as auricular cartilage grafting or hard palate graft.

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Conflicting interests: none.

This paper was presented in part at the meetings of the British Oculoplastic Surgery Society, Manchester, May 2002, and the European Society Ophthalmic Plastic Reconstructive Surgery, Munster, September 2002.

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