Ophthalmic Plastic and Reconstructive Surgery
Vol. 12, No. 2, pp 98–103

Reprinted from OPHTHALMIC PLASTIC AND RECONSTRUCTIVE SURGERY
Vol. 12, No. 2 June 1996
Lippincott-Raven Publishers Printed in U.S.A.

Involutional Entropion Repair by Posterior Lamella Tightening and Myectomy

George C. Charonis, M.D., and M. Douglas Gossman, M.D.

Department of Ophthalmology and Visual Sciences, University of Louisville, Louisville, Kentucky, U.S.A.

Summary: Involutional entropion is a common eyelid malposition of diverse etiology that may recur after surgical repair. Laxity of the tarsoligamentous complex combined with posteriorly directed rotational force exerted by the orbicularis, in our view, seems to be the most important in the production of entropion. A surgical technique has been developed that is carried out through a standard transcutaneous lower eyelid blepharoplasty incision. It includes tarsoligamentous tightening at the lateral canthus, bolstering of the lateral canthal tendon, and partial orbicularis myectomy. Forty-two procedures in 35 consecutive patients (29% for recurrent entropion) have been performed and evaluated (mean follow-up, 33 months). There have been no recurrences, and the esthetic outcome has been very good. **Key Words:** Involutional entropion—Canthal reconstruction—Periosteal flap—Orbicularis myectomy.

Involutional entropion occurs as the viscoelastic properties of various constituents of the internal lamellae of the lower eyelid undergo change during aging. The pathophysiologic abnormalities that have been proposed to account for this acquired eyelid malposition include horizontal (1–7) and vertical (3,7,8) tarsoligamentous laxity, tarsal rotation as a result of orbicularis oculi hypertrophy (9) and vertical translation (5,6,10), attenuation or disinsertion or both of the lower lid retractors (4,7,11,12), and orbital fat atrophy with secondary enophthalmos. These alterations, either alone or in concert, result in the characteristic posterior rotation of the lower eyelid margin that causes the eyelashes to abrade the conjunctiva and cornea.

Operative procedures that address correction of involutional entropion are numerous (2,13). Among these surgical techniques are creation of a full-thickness scar within the anterior lamella of the eyelid (14,15), outward rotation of the eyelid margin by advancement of the eyelid retractors to the anterior tarsus (16), horizontal eyelid shortening (17–19), lower retractor plication (11), redirection of orbicularis oculi muscle fibers (20) and modifications (21,22), lengthening of the posterior lamella with an ear cartilage graft (4), and combinations of the foregoing approaches (4,8,12,23–25). These methods have a common premise: creation of vector forces that inhibit inward rotation of the eyelid margin. Their effectiveness is reflected in their rates of recurrence, which range between zero and 30% (Table 1).

The surgical technique reported here restores tarsoligamentous tone and neutralizes overaction of the orbicularis oculi muscle. It evolved from consideration of the potential causes of entropion and the outcomes of other reparative techniques. It was first used in the management of recurrent cases, and a high success rate and the excellent esthetic result led to its application to the treatment of primary involutional entropion. This report discusses the details of the repair and its incidence of recurrence, complications, and esthetic outcomes.

SUBJECTS AND METHODS

Forty-eight eyelids of 39 consecutive patients with involutional entropion were repaired between

Manuscript received November 11, 1994; revised manuscript accepted July 10, 1995.

Address correspondence and reprint requests to Dr. M. D. Gossman, University of Louisville, Department of Ophthalmology & Visual Sciences, Louisville, KY 40292, U.S.A.

TABLE 1.

Author	Procedure	Lids	Follow-up	Recurrences	Complications/comments
Fox (1951;[18])	Lateral tarsoconj. & medial musculocutaneous resection	14	2–20 mo	0	1 overcorrection (spontaneously resolved)
Weis (1954;[16])	Marginal rotation of the eyelid lamellae	40	8 yr	0	Precise number of lids treated & follow-up data not available
Hill/Feldman (1967;[21])	Orbicularis stabilization & tissue barrier creation above & horizontal lid shortening	12 26	45.2 mo 36.8 mo	2 (16.7%) 0	1 trichiasis (7.1%)
Quickert and Rathbun (1971;[14])	Suture placement	12	5 yr	0	
Hargiss (1973;[29])	Orbital septum tucking; inferior aponeurosis tucking	50 46	55 mo 8 mo	8 (16%) 0	1 undercorrection/1 trichiasis 1 revision/1 overcorrection
Sisler (1973;[13])	Orbicularis stabilization	10	>24 mo	3 (30%)	
Leone (1975;[26])	Tarsal resection above & myectomy	15 22	NA NA	1 (6.6%) 0	2 undercorrections
Leber and Cramer (1977;[22])	Orbicularis stabilization	10	11–19 mo	0	
Collin and Rathbun (1978;[23])	Marginal rotation of eyelid lamellae & horizontal lid shortening	27	30 mo	1 (3.7%)	1 cyst in suture line/1 small conj. hematoma 1 ectropion spontaneously regressed
Rainin (1979;[25])	Horizontal eyelid shortening & suture placement	20	27 mo	1 (5%)	
Wesley and Collins (1983;[25])	Lower retractor tucking & horizontal lid shortening	26	6–32 mo	0	3 overcorrections (spontaneously resolved)
Jackson (1983;[8])	Horizontal lid shortening & suture barrier creation or retractor tucking	28	27 mo	0	
Hsu and Liu (1985;[2])	Pretarsal orbicularis fixation	172	14 mo	0	2 overcorrections/2 lid hematomas (spontaneously resolved)
Siegel (1988;[4])	Creation of "neotarsus" with ear cartilage graft	15	36 mo	0	1 overcorrection/1 lid hematoma
Carrol and Allen (1991;[12])	Variation of Quickert procedure	127	33 mo	0	
Lance and Wilkins (1991;[24])	Weis procedure above & horizontal lid shortening	66 29	>6 mo >6 mo	7 (11%) 0	2 overcorrections
Dresner and Karesh (1993;[30])	Lower retractor advancement, myectomy, horizontal shortening (transconjunctival approach)	23	9–18 mo	0	1 stitch abscess

1986 and 1991. Four patients (six eyelids) were lost to follow-up and were thus excluded from the study. Complete follow-up data were provided for 35 patients (16 men and 19 women) who underwent 42 procedures (seven patients had bilateral disease). The initial 12 procedures (29%) were performed on patients that had undergone previous surgical corrections and were referred to us because of recurrence. The average age of the patients was 75.1 years (range, 65–94 years), and the average follow-up was 33 months (range, 5–58 months). Follow-up was conducted by examination during the first year postoperatively and then by telephone contact at the time of the study. The patients were asked to report evidence of recurrence or return of their initial symptoms.

TECHNIQUE

Regional anesthesia is employed consisting of 2% lidocaine (Xylocaine) hydrochloride containing 1:100,000 epinephrine mixed with hyaluronic acid (Wydase) in a 1:10 ratio. A protective corneal cover is inserted under topical anesthesia. A subcilliary incision is used as in blepharoplasty, extending along the lower eyelid, and for 8.0 mm into the lateral canthal region. The eyelid is separated into two laminae in the potential plane between the posterior orbicular fascia and the orbital septum, allowing the skin and muscle to be retracted inferiorly. The lateral attachments of the lower tarsus to the orbital rim are then divided, allowing the eyelid to be stretched laterally over the orbital rim.

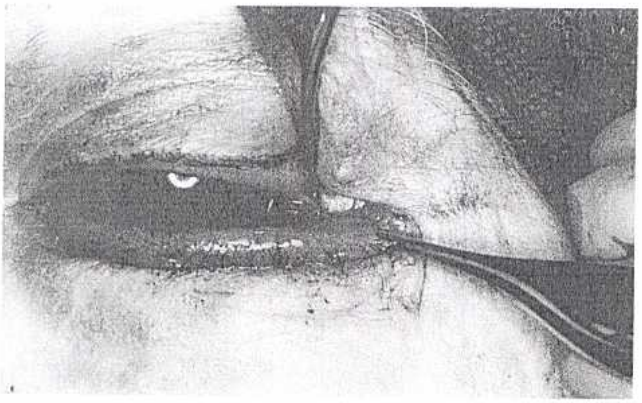

FIG. 1. The tarsus is drawn laterally until taut. The vertical forceps mark the plane of the medial wall of the lateral zygoma. The intersection of the tarsus with this imaginary plane determines the location of tarsal resection and is marked with dye.

A portion of the lateral tarsus is resected at the point at which it crosses the plane of the medial aspect of the lateral rim (Fig. 1). One needle of a double-armed, nonabsorbable suture (e.g., 4-0 Polydek, ME-2 needle) is advanced vertically through the cut edge of the lower tarsal plate. The second needle engages the superior crus of the lateral canthal tendon at the terminus of the upper tarsal plate (Fig. 2). The periosteum that overlies Whitnall's tubercle is exposed (this point is somewhat indistinct but is recognized as the thickest periosteum of the anterior lateral wall), and both needles are passed through this point ~3.0 mm posterior to the rim (Fig. 3). A 6-0 double-armed polyglactin suture is then placed within the lateral tarsus, traversing it from the conjunctival surface as a horizontal mattress stitch. A rectangular periosteal flap is elevated

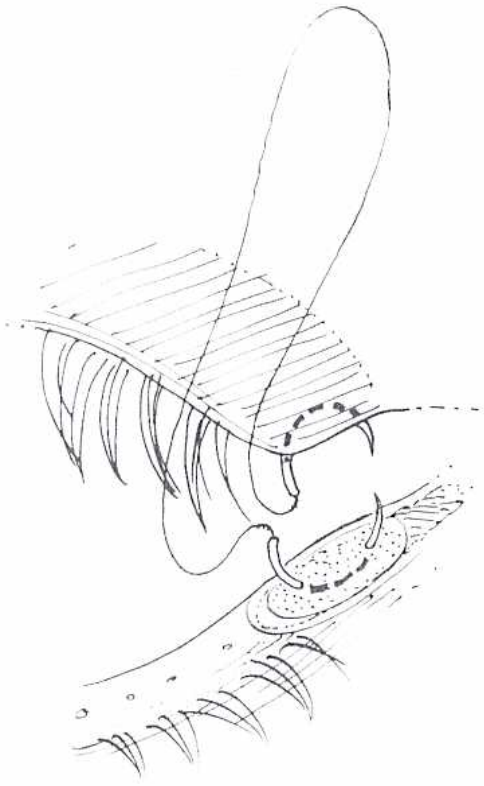

FIG. 2. One needle (ME-2) of a 4-0 nonabsorbable suture (Polydek, or Nylon S-22 needle) is advanced vertically through the cut edge of the lower tarsal plate. The second needle engages the upper tarsal terminus.

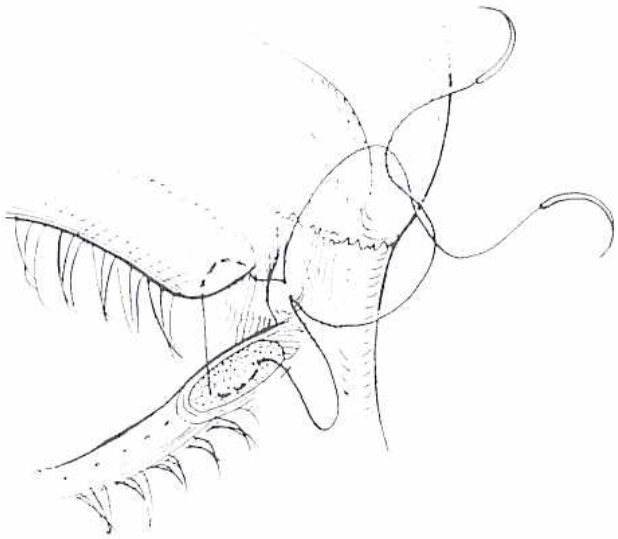

FIG. 3. Tarsoperiosteal adhesion: the tarsal sutures engage the periosteum that overlies Whitnall's tubercle. This is located ~3.0 mm posterior to the orbital rim and is the thickest periosteum of the anterior lateral wall but is often poorly defined as a visual landmark.

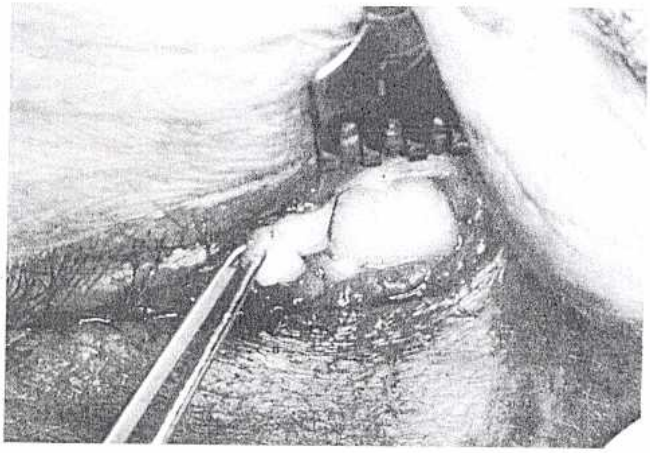

FIG. 4. A rectangular, medially based periosteal flap is elevated from the lateral zygoma.

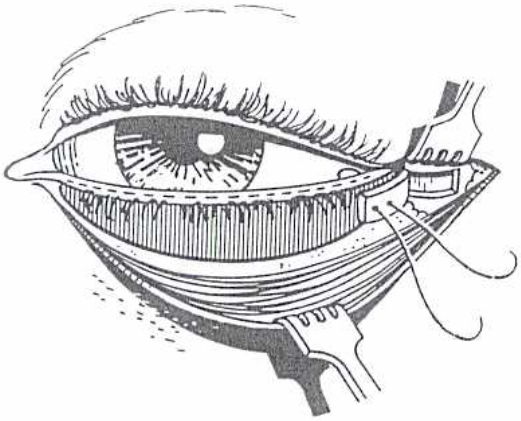

FIG. 5. The periosteal flap is attached to the anterior tarsus by a horizontal mattress 6-0 polyglactin suture, which is passed from posterior to anterior, engaging the full thickness of the tarsus.

from the lateral zygoma and advanced toward the orbital rim, where it remains fixed (Fig. 4). The tarsal sutures are tightened, securing the tarsus to the lateral periosteum, and the periosteal flap is attached to the anterior tarsus using the previously positioned polyglactin sutures (Fig. 5). The pretarsal and the upper preseptal orbicularis is then trimmed, leaving about one half of the muscle mass in situ (Fig. 6). Bleeding from the musculocutaneous perforating vessels that course vertically on the posterior surface of the muscle is expected, and its sources are identified by everting the skin–muscle composite and gently irrigating its posterior surface with saline. Bipolar coagulation is applied to the hemorrhagic points. The incision is closed with fine nonabsorbable sutures.

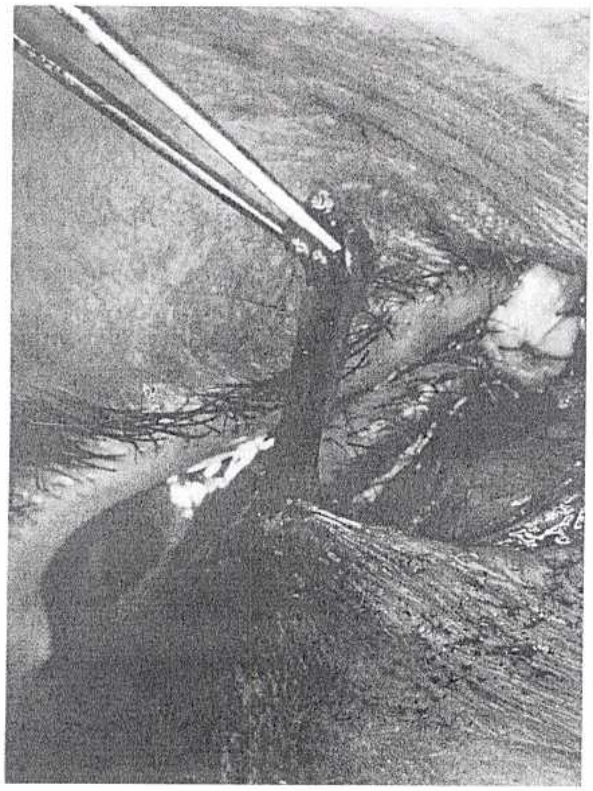

FIG. 6. About one half of the mass of the upper preseptal and pretarsal orbicularis oculi muscle is trimmed by using straight iris scissors.

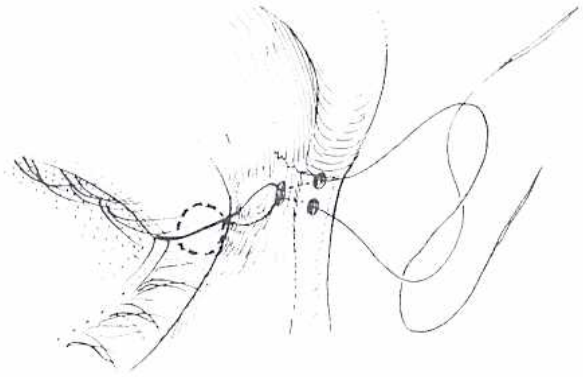

FIG. 7. Tarsoosseous adhesion: two 1.0 mm holes are drilled in the lateral orbital rim that taper to a common medial opening when periosteal fixation is impossible. The tarsal sutures are brought through the holes by a guide wire and securely tied on the lateral surface of the zygoma.

A potential technical pitfall that may occur is the shedding of the periorbita during needle passage. Additionally, in older patients, the periorbita may be too attenuated to retain the sutures. In these cases, a direct tarsoosseous union is established as follows: Two 1.0-mm holes are drilled at the lateral ortibal rim at a point ~1 mm superior to the plane of the medial canthal tendon. This point is best determined by first delineating by marker the plane of the medial canthal tendon on the lateral orbital rim. The surgeon's point of view is optimally at the patient's head during this maneuver to avoid parallax. Using a caliper, the location of the holes to be drilled is marked 1 mm above the first mark. The holes are drilled to a common medial opening. Using a 30-gauge folded wire as a guide, the tarsal sutures are brought through the holes and securely tied on the lateral surface of the zygoma (Fig. 7).

RESULTS

Of the 42 eyelids in this study, there have been no recurrences. The mean follow-up is 33 months (range, 5–58 months). Overcorrection did not occur in any case. Patient satisfaction with the esthetic result has been good. Prolonged tenderness to palpation over the site of the periosteal flap has been

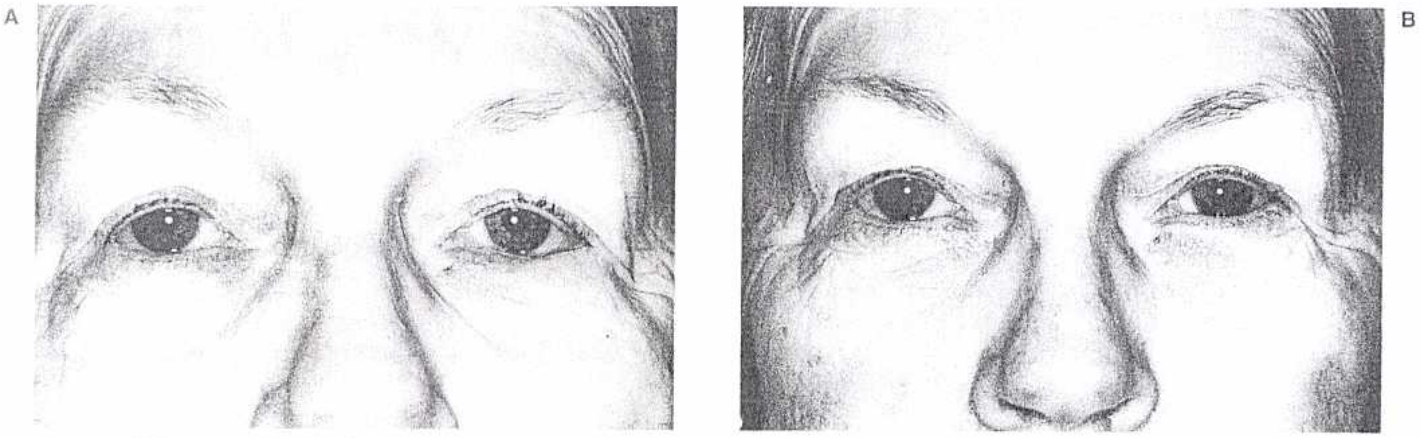

FIG. 8. Preoperative (A) and postoperative (B) photographs of a patient with left lower eyelid involutional entropion.

noted by many patients but has typically resolved within 6 months. One patient developed postoperative chemosis of unknown etiology that resolved spontaneously. Another developed two asymptomatic trichiatic eyelashes. A pyogenic granuloma required excision and removal of the Polydek suture material in two patients.

DISCUSSION

Multiple pathophysiologic abnormalities have been implicated in involutional entropion. Orbicularis oculi overaction and mobility, horizontal eyelid laxity, and retractor dehiscence are dominant forces (1–7). Most reconstructive techniques incorporate horizontal eyelid tightening (3,8,12,17,19,24). However, when such shortening was the only procedure performed by us in 12 patients, we observed two recurrences (unpublished data). Our analysis of the cause of recurrence pointed to overaction of the preseptal and pretarsal portions of the orbicularis oculi muscle, because the tarsoligamentous apparatus remained taut, and retractor dehiscence was not identified intraoperatively. Leone (26) reported a similar experience with one recurrence (6.6%) and two undercorrections (13.2%) in 15 entropic eyelids treated by tarsal resection alone. When orbicularis myectomy was added, no recurrence was observed.

The method employed to restore tone to the tarsoligamentous component of the lower eyelid may be an additional factor that favors recurrence of entropion. The fibrous attachments that secure the tarsus to the lateral orbit become attenuated with time. Tightening of the posterior lamella by the method of tarsal resection alone without enhancement of the tarsoperiosteal attachment adds stress to these ligaments, perhaps leading to dehiscence and recurrence of entropion.

Cadaveric dissections have demonstrated that the lower tarsal plate is bound to the orbital rim by complex attachments that may be dehisced from the tarsus in older specimens. One of these elements, the posterior limb of the lateral canthal tendon, inserts to the periosteum over the lateral orbital tubercle (of Whitnall), ~3 mm behind the orbital rim (27). An anterior component continues in close association with the fascia that overlies the periosteum of the lateral orbital rim, inserting on the lateral anterior tarsal surface. Therefore, lateral tarsal reattachment to the orbital rim ideally involves both an anterior and a posterior component. In the technique described, the posterior tarsoperiosteal reconstruction is achieved by approximating the tarsus to the periosteum with sutures. The anterior bolster is created from a strip of periosteum developed from the anterior zygoma. This "periosteal tongue" was first described by Smith and Cherubini (28) in the reconstruction of lateral eyelid defects. In entropion repair, this flap serves two functions: (a) during healing, scar contracture and fibrous tissue formation increase the tensile strength of the flap, adding further support to the lateral tarsal attachment, and (b) it covers the Polydek suture, minimizing the chance of pyogenic granuloma formation.

Earlier studies on the pathophysiology of involutional entropion have demonstrated the superior and forward migration of the preseptal orbicularis, which overrides the pretarsal part of the muscle and creates an inward rotation of the eyelid (5,6,10). The final step of the procedure involves a subtotal pretarsal and preseptal orbicularis oculi myectomy.

The myectomy weakens the force of orbicularis contraction and also reduces migration potential of the muscle by fostering adhesions between the muscle and tarsus.

Although this procedure addresses two dominant mechanisms of entropion production, it does not include repair of the lower eyelid retractors, whose contribution to the creation of involutional entropion has been implicated by several authors. Plication of the retractors has not been necessary when the operation is performed as we have described. However, the subcilliary incision provides excellent exposure of the retractors, should their advancement be deemed necessary by the surgeon.

This surgical technique has produced excellent results in the management of complicated, recurrent involutional entropion and also primary cases (Fig. 8). The method employs an incision familiar to most ophthalmic surgeons, that of a transcutaneous lower eyelid blepharoplasty, and may easily be incorporated in their therapeutic armamentarium.

REFERENCES

1. de Roetth A. Mechanism of the senile entropion. *Trans Pac Coast Ophthalmol Soc* 1963;44:173–7.
2. Hsu WM, Liu D. A new approach to the correction of involutional entropion by pretarsal orbicularis oculi muscle fixation. *Am J Ophthalmol* 1985;100:802–5.
3. Rainin EA. Senile entropion. *Arch Ophthalmol* 1979;97: 928–30.
4. Siegel RJ. Involutional entropion. A simple and stable repair. *Plast Reconstr Surg* 1988;82(1):42–6.
5. Jelks JW, Jelks EB. The influence of orbital and eyelid anatomy on the palpebral aperture. *Clin Plast Surg* 1991; 18(1):1831–95.
6. Markovits AS. Variations on the theme of involutional entropion and the Quickert repair. *Ann Ophthalmol* 1980;50: 1029–40.
7. Benger RS, Musch DC. A comparable study of eyelid parameters in involutional entropion. *Ophthal Plast Reconstr Surg* 1989;5:281–7.
8. Jackson ST. Surgery for involutional entropion. *Ophthalmic Surg* 1983;14:322–6.
9. Sisler HA, Labry JR, Finllay TR. Senile ectropion and entropion: a comparative histopathological study. *Ann Ophthalmol* 1976;10:319–22.
10. Dalgleish R, Smith JLS. Mechanics and histology of senile entropion. *Br J Ophthalmol* 1966;50:79–91.
11. Jones LT. The anatomy of the lower eyelid and its relation to the cause and cure of entropion. *Am J Ophthalmol* 1960; 49:29–36.
12. Carroll RP, Allen SE. Combined procedures for repair of involutional entropion. *Ophthal Plast Reconstr Surg* 1991; 7:123–7.
13. Sisler HA. A biomechanical and physiological approach to corrective surgery for senile entropion. *Ann Ophthalmol* 1973;12:483–95.
14. Quickert MH, Rathburn E. Suture repair of entropion. *Arch Ophthalmol* 1973;12:483–95.
15. Zeigler SL. Galvanocautery puncture in ectropion and entropion. *JAMA* 1909;53:183.
16. Weis FA. Spastic entropion. *Trans Am Acad Ophthalmol Otolatyngol* 1955;59:503–6.
17. Butler JBV. A simple operation for entropion. *Arch Ophthalmol* 1948;40:665–7.
18. Fox SA. Relief of senile entropion. *Arch Ophthalmol* 1951;46:424–31.
19. Bick MW. Surgical management of orbital tarsal disparity. *Arch Ophthalmol* 1966;75:386–9.
20. Wheeler JM. Spastic entropion correction by orbicularis transplantation. *Am J Ophthalmol* 1939;22:477–83.
21. Sill JC, Feldman FF. Tissue barrier modifications of a Wheeler II operation for entropion. *Arch Ophthalmol* 1967; 78:621–3.
22. Leber DC, Cramer LM. Correction of entropion in the elderly. A muscle flap procedure. *Plast Reconstr Surg* 1977; 60(5):704–9.
23. Collins JR, Rathbun JE. Involutional entropion. A review with evaluation of a procedure. *Arch Ophthalmol* 1978;96: 1058–64.
24. Lance SE, Wilkins RB. Involutional entropion—a retrospective analysis of the Wies procedure alone or combined with a horizontal shortening procedure. *Ophthal Plast Reconstr Surg* 1991;7:273–7.
25. Wesley RE, Collins JW. Combined procedure for senile entropion. *Ophthalmic Surg* 1983;14:401–5.
26. Leone CR. Internal tarsus-orbicularis resection for senile spastic entropion. *Ann Ophthalmol* 1975;7(7):1004–6.
27. Zide BM, Jelks GW. *Surgical anatomy of the orbit*. New York: Raven Press, 1985.
28. Smith B, Cherubini TD. *Oculoplastic surgery. A compendium of principles and techniques*. St. Louis: CV Mosby, 1970.
29. Hargiss JL. Inferior aponeurosis vs orbital septum tucking for senile entropion. *Arch Ophthalmol* 1973;89:210–3.
30. Dresner SC, Karesh JW. Transconjunctival entropion repair. *Arch Ophthalmol* 1993;111:1144–8.