

Surgical Management of Encapsulated Filtering Blebs

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Abstract: Encapsulated filtering blebs associated with elevated intraocular pressure or symptomatic dellen formation, unresponsive to conservative therapy, developed in 24 of 222 eyes following glaucoma filtering surgery over a five-year period, an incidence of 11%. Nine of 13 eyes were treated successfully with primary needling of the bleb. Ten of 11 eyes were successfully treated with primary bleb revision. Four eyes were successfully treated with a combination of needling and surgical revision and one eye required cyclocryotherapy. The overall success rate of needling or bleb revision was 96% after an average follow-up of 20 months. Thus, encapsulation of the filtering bleb, although requiring additional surgery in many cases, carries a favorable long-term prognosis. [Key words: conjunctiva, cicatrix, dellen, filtering bleb, glaucoma, Tenon's capsule.] *Ophthalmology* 92:955-958, 1985

Although most patients develop functioning filtering blebs following glaucoma filtering surgery, a small percentage develop encapsulation of the bleb. This condition has been variously termed exteriorization of the anterior chamber, cyst of Tenon's capsule, "cystic" bleb, or encapsulated bleb.¹⁻⁵ The clinical appearance is striking, with a highly elevated and localized "bean-shaped" bleb and vascular engorgement of the overlying conjunctiva (Fig 1). The intraocular pressure (IOP) is usually elevated and the patient may be symptomatic from localized corneal drying adjacent to the elevated bleb. Medical therapy and massage may be effective, but needling or surgical revision is often necessary.¹⁻⁸

The present study summarizes the management of 24 eyes with encapsulated blebs following filtering surgery that were not responsive to medical therapy or massage. The results of needling or surgical revision are presented.

MATERIALS AND METHODS

All patients originally underwent glaucoma filtering surgery by one of the authors (JEP). Modified trabecu-

lectomy consisted of dissection of the inner scleral window anterior to the scleral spur, ie. no cyclodialysis. Thermal sclerostomy was performed in the standard manner. Limbal-based conjunctival flaps were used in all cases and the conjunctiva was closed with running 6-0 plain gut suture. All eyes were treated with topical corticosteroid drops and atropine during the postoperative period. Encapsulated blebs resulting from filtering surgery performed between July 1979 and March 1984 are reported. During that 57-month period, 222 filtering procedures were performed. Of those eyes, 24 developed encapsulated blebs unresponsive to medical therapy or digital massage. The clinical data of those 24 cases are summarized in Table 1.

Thirteen eyes were needled as the primary procedure; ten were needled once, three were needled twice. One eye was needled after surgical revision. Eleven eyes underwent surgical bleb revision as the primary procedure; ten were revised once and one was revised twice. Four eyes were surgically revised after needling.

The surgical indications were as follows: IOP elevation, 16 eyes; IOP elevation with pain, 5; pain without IOP elevation, 3. Pain was usually related to large dellen formation or interference of lid function due the large bleb. Dellen were treated conservatively with lubricants.⁹

NEEDLING PROCEDURE (Fig 2)

Under topical anesthesia, a lid speculum is placed between the lids. A salt solution is injected subconjunctivally adjacent to the encapsulated bleb through a 30-

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Fig 1. Typical clinical appearance of encapsulated bleb prior to surgical treatment.

gauge needle attached to a 1 to 3 ml syringe. A suitable small needle-knife is then passed subconjunctivally through the same needle track, and through the thick fibrous wall of the encapsulated bleb. With a slight sawing and sweeping motion, a 2-4 mm incision is created in the fibrous wall, with care taken not to perforate the overlying tissues. Immediately following this incision, the original bleb flattens and the adjacent subconjunctival space swells due to lateral flow of aqueous. The knife is withdrawn, topical antibiotic drops administered, and a patch applied to the eye for 24 to 48 hours.

Table 1. Clinical Data of 22 Patients (24 Eyes) Aged 31 to 84 Years

Data*	Number of Patients
Sex	
Male	14
Female	8
Race	
White	21
Asian	1
Type of glaucoma	
Primary open-angle	16
Pseudoexfoliation	3
Aphakia	3
Pseudophakia	1
Iridocyclitis	1
Type of original surgery	
Modified trabeculectomy	20
Thermal sclerostomy	4
Preop laser trabeculoplasty	
Yes	13
No	11
Dellen formation	
Yes	10
No	14

* Intraocular pressure ranged from 18 to 60 mmHg (mean, 30 mmHg) prior to original surgery. Interval between original surgery and encapsulation ranged from 8 days to 6 weeks (mean, 3.5 weeks). Intraocular pressure after encapsulation ranged from 8 to 60 mmHg (mean, 31 mmHg).

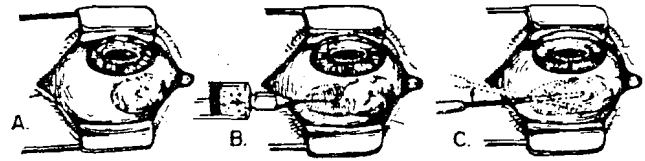


Fig 2. Needling of bleb. A. Encapsulated bleb prior to needling. B. Subconjunctival injection of salt solution adjacent to bleb. C. Needle-knife inserted subconjunctivally lyses adhesions of Tenon's capsule to sclera with sweeping-sawing motion.

SURGICAL REVISION (Fig 3)

Following placement of the superior rectus bridle suture, an incision is made through the conjunctiva and Tenon's capsule 1 to 2 mm superior to the superior margin of the encapsulated bleb. A blunt scissor is used to dissect the conjunctiva from the underlying elevated thick fibrous wall of Tenon's capsule. Injection of salt solution between these layers facilitates the dissection. The dissection is carried forward to the limbus, exposing the large pale cyst of Tenon's capsule overlying the sclera. A needle-knife track is made into the anterior chamber through the peripheral cornea. A small sharp scissor is then used to completely excise the cyst from the sclera. The original filtering site becomes exposed and aqueous humor flows freely from the sclerostomy. The overlying conjunctiva is closed with a running suture. Occasionally, a small buttonhole of the conjunctiva is discovered once the bleb is reinflated with salt solution injection into the anterior chamber through the peripheral corneal needle track. The buttonhole is readily closed with a 10-0 nylon suture on a tapered needle.¹⁰

RESULTS

The incidence of bleb encapsulation which was unresponsive to conservative therapy was 11%. Patients destined to develop encapsulated blebs developed significant vasodilatation or congestion of conjunctival vessels during the postoperative period prior to actual development of encapsulation. The desired pallor of the filtering bleb was not noted. However, it was not possible to predict which patients would develop clinically significant encapsulation. The needling and surgical revision results are presented in Table 2. The average follow-up of the 24 eyes was 20 months, with a range of 6 to 40 months.

Clinical success was defined as an intraocular pressure of 22 mmHg or less (at the time of most recent examination) and freedom from discomfort of the bleb. Using these criteria, the overall success rate following needling or surgical revision, or both, was 96%.

NEEDLING

Nine of 13 eyes (69%) were successfully treated with primary needling of the bleb. Four eyes underwent bleb revision following unsuccessful needling. Of these eyes, three were successful and one (the pseudophakic eye) required subsequent cyclocryotherapy. Needling of the

bleb resulted in a temporary conjunctival wound leak which was frequently closed by the first postoperative visit (2-3 days), and in all cases, by one week. No infections or other complications were encountered.

SURGICAL REVISION

Ten of 11 eyes (91%) were successfully treated with primary bleb revision. The remaining eye was successfully treated with subsequent needling. No wound leaks or other surgical complications were encountered.

The following potential risk factors for development of an encapsulated bleb could be identified in some eyes: postoperative hypotony (IOP 0-2 mmHg), 8; flat anterior chamber, 2; postoperative hyphema, 5; age less than 35 years, 3; previous intraocular surgery, 6. Some patients had multiple risk factors. Nine cases had no identifiable risk factors, pre- or postoperatively.

Following needling or bleb revision, the blebs became much less elevated and localized. The final bleb appearance of the 24 eyes was as follows: pale and diffuse, 17; thin and cystic, 4; slightly localized, 2; no bleb, 1. The four thin, cystic blebs occurred following surgical revision.

DISCUSSION

Encapsulation of the bleb typically occurs during the first six weeks following filtering surgery. In contrast to flat failed blebs, encapsulated blebs are dramatic in appearance, yet the intraocular pressure is also usually uncontrolled. Medical treatment and massage have been advocated for treatment of encapsulated blebs, and may be effective if instituted early.¹⁻⁸ In the present study, only those encapsulated blebs which were not responsive to conservative therapy are presented. The incidence of incomplete encapsulation in the present study is unknown.

Since the treatment of encapsulated blebs evolved in the present retrospective report, the exact sequence of treatment varied. Originally, revision of the bleb was the primary procedure. Later, needling of the bleb became the primary procedure, followed by surgical revision, if necessary. The success rate following primary surgical revision, 91%, was slightly higher than following primary needling, 69%. No significant complication was encountered following either procedure. The cumulative success rate, including those eyes requiring a combination of needling and surgical revision, was 96%. This indicates

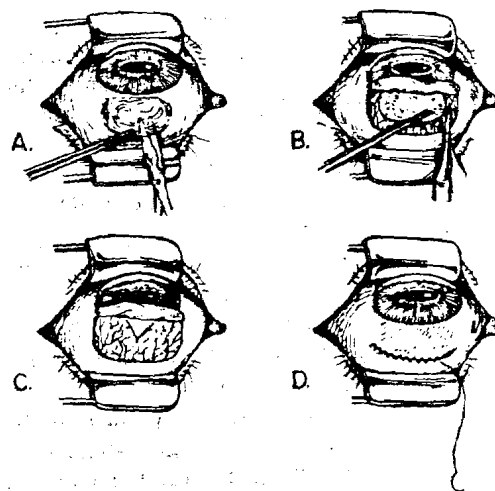


Fig 3. Surgical bleb revision. A. Conjunctiva is dissected free from Tenon's capsule with blunt scissors. B. Clear white cyst of Tenon's capsule is excised completely. C. Original filtration site is exposed. D. Conjunctiva is reapproximated with running suture.

a positive prognosis in those eyes requiring intervention for encapsulation of the bleb.

Needling of the bleb has been described by several authors, with various modifications.¹⁻⁷ One potential risk is inadvertent perforation of the conjunctiva overlying the cystic space of Tenon's capsule. Another potential complication is infection of the bleb, since the entrance site of the needle-knife may leak for a day or two. This complication was not observed, and was possibly minimized by antibiotic therapy and patching.

The reason for the high success rate of surgical revision of encapsulated blebs is unclear. The success rate of reoperation after a failed filtering procedure is believed to be lower than the success rate after the primary procedure, yet the success rate of surgical revision of encapsulated blebs was 91%. Surgical revision of encapsulated blebs requires only extraocular manipulations, whereas reoperation following a failed filtering operation requires intraocular manipulation. Following bleb revision, less postoperative inflammation may occur, with less stimulus for proliferation or condensation of Tenon's capsule, which appears to be responsible for bleb failure.^{1,11}

The possible etiologic factors leading to encapsulation of the bleb are unknown. Nine eyes had totally uncomplicated postoperative courses and no identifiable preoperative risk factors. All 24 eyes had limbal-based conjunctival flaps. Whether the incidence of encapsula-

Table 2. Surgical or Needling Results

Primary Procedure	No. Eyes	No. Successful		Secondary Procedure	No. Eyes	No. Successful
		No. Medications	Medications			
Needling	13	3	6	Revision	4	3*
Revision	11	7	3	Needling	1	1

* Unsuccessful eye required cyclocryotherapy.

tion would be reduced by a fornix-based flap is unknown. The margin of the encapsulated bleb did seem to follow the margin of the conjunctival dissection done at the time of the original glaucoma surgery. Gut suture was used to close the conjunctiva and could lead to localized inflammation and adhesion to the sclera. However, this cannot account for the development of lateral adhesions. The influence of the type of original surgery on the outcome could not be evaluated, since most patients underwent a modified trabeculectomy.

In retrospect, perhaps some patients would have been spared needling or revision with more aggressive medical therapy or massage earlier in the course of management. However, it was not possible to predict which patients would develop encapsulated blebs. Medical therapy or massage was not instituted until the IOP rose or the patient became symptomatic from dellen formation.

In summary, encapsulation of the filtering bleb is an undesirable complication occurring in the early postoperative period. However, the ultimate prognosis for these patients is good, in contrast to those with outright failure (scarring down) of the bleb. Needling of the bleb should be employed as the primary treatment, if medical therapy or massage are not effective.

Discussion

by

E. Michael Van Buskirk, MD

This is a most interesting paper concerning encapsulated blebs following filtering surgery, a complication that is not rare, yet receives little attention in the literature.

We have learned that bleb encapsulation requiring surgical revision occurs as often as 11% of the time, but we still do not know the total incidence of encapsulated blebs which are medically and surgically managed. In our series of seven cases, reported in 1982, the four that were revised did not do as well as those not revised; but, of course, the revisions were done on the most severe cases. Although the tension was ultimately controlled in all cases, three of the four operated cases have required long-term medical therapy, while those managed medically ultimately filtered well without adjunctive medication.¹

Although nearly all of Dr. Pederson's surgically managed cases eventually did well, only three of the 13 needled cases and 10 of the total 24 cases were ultimately controlled without chronic glaucoma therapy. Thus, although the prognosis for eventual intraocular pressure control is generally good, most patients ultimately need supplemental hypotensive drugs. Hence, their final glaucoma control is satisfactory, but the actual filter is suboptimal. An important point to bear in mind is the tendency toward recurrence of bleb encapsulation just after the original surgery, and even as soon as two weeks after revision. Because we have seen bleb encapsulation recur within ten days of excision and our medically treated patients generally do well, we manage nearly all encapsulated blebs medically, without further surgery. We use two modalities in medical management: massage or compression and topical steroids. As

REFERENCES

1. Maumenee AE. External filtering operations for glaucoma: the mechanism of function and failure. *Trans Am Ophthalmol Soc* 1960; 58:319-28.
2. Fitzgerald JR, McCarthy JL. Surgery of the filtering bleb. *Arch Ophthalmol* 1962; 68:453-67.
3. McCulloch C. Surgery of filtering blebs. *Int Ophthalmol Clin* 1967; 7(1):125-34.
4. Cohen JS, Shaffer RN, Hetherington J Jr, Hoskins D. Revision of filtration surgery. *Arch Ophthalmol* 1977; 95:1612-5.
5. van Buskirk EM. Cysts of Tenon's capsule following filtration surgery. *Am J Ophthalmol* 1982; 94:522-7.
6. Ferrer H. Conjunctival dialysis in the treatment of glaucoma recurrent after sclerectomy. *Am J Ophthalmol* 1941; 24:788-90.
7. McCulloch C. The incision of inadequate filtration blebs. *Trans Can Ophthalmol Soc* 1958; 20:45-50.
8. Sugar HS. Complications, repair and reoperation of antiglaucoma filtering blebs. *Am J Ophthalmol* 1967; 63:825-33.
9. Soong HK, Quigley HA. Dellen associated with filtering blebs. *Arch Ophthalmol* 1983; 101:385-7.
10. Petursson GJ, Fraunfelder FT. Repair of an inadvertent buttonhole or leaking filtering bleb. *Arch Ophthalmol* 1979; 97:926-7.
11. Addicks EM, Quigley HA, Green WR, Robin AL. Histologic characteristics of filtering blebs in glaucomatous eyes. *Arch Ophthalmol* 1983; 101:795-8.

the paper points out, an unusually localized, distended, glistening, vascular appearance is an early clue to developing encapsulation. In this case, we administer topical prednisolone at least every two hours. If the tension is even slightly elevated to the mid-teens, we compress the bleb in the office with a cotton applicator, trying to get the entrapped aqueous to break through to the subconjunctival space. This procedure is repeated at the slit lamp several times weekly until the aqueous begins to percolate into the subconjunctival space, as it nearly always does. After the second week, the patient applies conventional digital massage at home.

This study has made an important contribution by demonstrating that this dramatic appearing encapsulated bleb is not a rare occurrence and by detailing its surgical management. We can be reassured that, despite their unsightly appearance, most will eventually filter well, but more than half will require a return to chronic glaucoma therapy. Although these cases did well with surgical excision, I believe that most cases will respond, with perseverance, to medical management, using massage and topical steroids alone. I am encouraged that so many cases do so well with surgical revision; prior to further glaucoma reoperations, however, the surgeon should recall that every invasion of the conjunctiva adds more fibrosis to compromise any subsequent procedures that may be needed. I urge surgeons to give medical management a thorough trial before reoperating. These are difficult cases and require perseverance from both patient and surgeon to avoid giving up on a potentially salvable bleb.

Reference

1. Van Buskirk EM. Cysts of Tenon's capsule following filtration surgery. *Am J Ophthalmol* 1982; 94:522-7.

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