

Glaucoma laser suture lysis

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Abstract

Aim—Suture lysis is commonly performed after trabeculectomy to improve bleb function. It is often thought to be an innocuous procedure. This is the first large study to determine the safety of the procedure and compare results with a control group.

Methods—Two hundred successive trabeculectomies performed between January 1992 and October 1993 were analysed.

Results—Ninety nine eyes underwent trabeculectomy and suture lysis; 101 eyes underwent trabeculectomy and did not require postoperative suture lysis. The following complications were noted with suture lysis: flat chambers (13.1%), external aqueous leaks (9%), malignant glaucoma (2%), iris incarceration (2%), and large blebs (2%). All resolved with appropriate management. There was no significant difference in the final postoperative mean pressures between the lysis and the non-lysis groups.

Conclusion—Suture lysis is not an innocuous procedure. However if managed appropriately, complications do not affect the intraocular pressure outcome.

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Laser suture lysis is considered a relatively innocuous procedure. It was originally described by Lieberman¹ and Hoskins and Migliazzo.² Complications have been reported either in small series or as case reports.³⁻⁸ This study was undertaken to evaluate the safety of the procedure and to compare the intraocular pressure response in patients undergoing suture lysis with those that did not require suture lysis in a large series.

Materials and methods

Two hundred consecutive trabeculectomies from a hospital based university tertiary referral practice were reviewed. All surgery was performed between January 1992 and October 1993.

Surgery was performed as inpatient or day surgery, under local anaesthesia by the authors. Our technique has been reported elsewhere.⁹ Briefly, a fornix based conjunctival flap was used routinely except in cases when mitomycin C was applied. In these cases a limbal based conjunctival flap was used. A triangular half thickness scleral flap with 4 mm sides was created in each case, and after the sclerectomy and iridectomy were performed, the flap was firmly closed with two or three 10/0 nylon sutures. The conjunctiva was closed with 8/0 dextron. At the completion of surgery topical

atropine sulphate was applied, and subconjunctival gentamicin 20 mg and dexamethasone sodium phosphate 4 mg were given.

Postoperatively, patients were evaluated on days 1 and 2, twice in the second week, then once in the third week, and then at 6 weeks. If there were complications patients were seen more frequently than this. Suture lysis was not performed before day 4 or after the third week. The indication for suture lysis was poor aqueous filtration (flat bleb, high IOP) due to tight wound closure. The argon laser settings were a 50 μm spot size, a duration of 0.1 second, and a power setting between 0.450 and 0.600 W. A Hoskins lens was used in each case. After suture lysis, gentle digital massage or lens pressure was usually applied to elevate the bleb. Patients were re-examined within 1 hour of suture lysis, 24 hours later, and as often as required thereafter.

Statistical analysis of data included a *t* test for comparisons of means. The χ^2 test was used for comparison of proportions.

Results

Ninety nine eyes of 88 patients had trabeculectomies that required suture lysis in the early postoperative period; 101 eyes of 92 patients had trabeculectomies that did not require suture lysis.

Table 1 reviews the patient data, glaucoma profile, preoperative data, surgical characteristics, and postoperative data of the two groups. As indicated, there were no significant differences in the two groups in terms of age, race, sex, preoperative intraocular pressures, preoperative medications, and type of glaucoma. Thirty one eyes in the group that had suture lysis had prior ocular surgery involving a conjunctival incision, compared with 24 eyes in the group that did not require suture lysis.

Thirty patients had filtration surgery augmented with mitomycin C in the group that did not require suture lysis compared with 24 patients who had suture lysis. Thirty eight patients had postoperative 5-fluorouracil in the suture lysis group compared with 11 patients in the group that did not require suture lysis ($p \leq 0.001$). The mean number of scleral flap 10/0 nylon sutures in the group that had suture lysis was 2.7 and in the group that did not have suture lysis was 2.5.

There was no significant difference in the final mean postoperative intraocular pressures between the two groups, or in the mean number of postoperative antiglaucoma medications. The final mean follow up time in the group with suture lysis was 10.3 (SD 5.5) months and in the group without suture lysis was 10.1 (6.8) months.

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Table 1 Patient, disease, preoperative data, surgery, and postoperative data

| Patient variable | Group with no lysis (101 eyes, 92 patients) | Group with suture lysis (99 eyes, 88 patients) | p Value |
|--|--|---|---------|
| Mean age (SD) | 63.4 (15.2) | 63.7 (13.9) | NS |
| Race (white, black, Asian) | 83, 6, 3 | 77, 6, 5 | NS |
| Sex (M/F) | 45/47 | 41/47 | NS |
| Preoperative intraocular pressure (mm Hg) (mean (SD)) | 22.7 (5.8) | 22.5 (6.9) | NS |
| Preoperative No of medications (mean (SD)) | 2.6 (0.8) | 2.4 (0.8) | NS |
| Primary open angle glaucoma (No of eyes (%)) | 59 (58.4) | 51 (51.5) | NS |
| Chronic angle closure glaucoma (No of eyes (%)) | 18 (17.8) | 20 (20.2) | NS |
| Normal tension glaucoma (No of eyes (%)) | 5 (4.9) | 8 (8.1) | NS |
| Pseudoexfoliative glaucoma (No of eyes (%)) | 5 (4.9) | 10 (10.1) | NS |
| Prior ocular surgery with a conjunctival incision (No of eyes (%)) | 24 (23.8) | 31 (31.3) | NS |
| Fornix based conjunctival flaps | 72 (71.3) | 79 (79.8) | NS |
| Intraoperative administration of MMC | 30 (29.7) | 22 (22.2) | NS |
| Postoperative administration of 5-fluorouracil | 11 (10.9) | 38 (38.4) | <0.001 |
| Scleral flap sutures | 2.5 (0.7) | 2.7 (0.6) | NS |
| Mean postoperative intraocular pressure at last visit (mm Hg) (SD) | 13.6 (5.4) | 13.7 (4.9) | NS |
| Mean No of medications at last visit | 0.8 (1.1) | 0.7 (1.0) | NS |
| Mean follow up (months) (SD) (minimum 3 months) | 10.1 (6.8) | 10.3 (5.5) | NS |

NS=differences not statistically significant.

Ninety nine eyes underwent suture lysis. Three sutures from three eyes were not successfully lysed in the postoperative period owing to inadequate suture visualisation. Fifty two eyes (52.5%) required lysis of a second suture and 18 eyes required lysis of a third suture. The mean IOP (SD) immediately before cutting the sutures was 23.6 (7.4) mm Hg for the first suture, 22.0 (7.5) mm Hg for the second suture, and 18.2 (6.6) mm Hg for the third suture. The mean IOP (SD) immediately after suture lysis for the first suture was 11.2 (7.4) mm Hg, after the second suture 10.2 (5.2) mm Hg, and after the third suture 9.1 (6.3) mm Hg.

Table 2 reviews the success rate in terms of IOP control between the two groups 10 months after surgery. Unqualified success was defined as a postoperative IOP of less than 21 mm Hg with a reduction in the IOP (from the preoperative level) of greater than 30% with or without medications: 76.2% of eyes that did not require suture lysis were an unqualified success.

Seventy two of 99 eyes (72.7%) that had postoperative suture lysis were an unqualified success. Qualified success was defined as a postoperative IOP of less than 21 mm Hg with a reduction in the IOP (from the preoperative level) of between 10 and 30% with medications. Twelve of 101 eyes that did not require suture lysis were a qualified success and 15 of 99 eyes that required suture lysis were a qualified success. Failure was defined as a postoperative IOP greater than 21 mm Hg or a reduction in the IOP (from the preoperative level) of less than 10% despite medications. Eleven of 101 eyes that did not require suture lysis and 12 of 99 of eyes that did require suture lysis were considered surgical failures.

The complications following suture lysis are reviewed in Table 3. We define a flat anterior chamber as iridocorneal touch up to the pupil

margin with or without lens corneal touch: 13% of eyes had a flat anterior chamber after suture lysis. None had lens corneal touch; five of these followed the use of antimetabolites (two cases had intraoperative mitomycin C and three cases had postoperative 5-fluorouracil). All flat chambers were observed within 72 hours of suture lysis. Surgical reformation of the anterior chamber was not required in any case as all settled with conservative measures after a mean duration of 5.4 days. Using the success criteria as defined previously, eight out of 13 eyes that had flat chambers after suture lysis were unqualified successes, four eyes were qualified successes, and one eye was considered a failure.

The next most common complication was an external aqueous leak which was observed in 9% of eyes after suture lysis. All cases of external leaks were observed within 72 hours of suture lysis. In no case was an external leak present before suture lysis. Two eyes with an external leak had an associated flat chamber. All cases with an external leak settled with conservative measures after a mean duration of 4.6 days. Using the success criteria as defined previously, four (4/9) eyes with external leaks after suture lysis were unqualified successes, two (2/9) eyes were qualified successes, and three eyes (3/9) were considered failures.

Two cases of malignant glaucoma were precipitated by suture lysis. Both cases were in phakic eyes with pre-existing narrow angles. The onset of malignant glaucoma in each case was within 48 hours of suture lysis. Both cases were successfully managed medically, over 5 days in the first case and 7 days in the second. Iris incarceration was observed within 24 hours after suture lysis in two eyes. Both cases required surgical repair.

Two cases developed a noticeable hyphaema after suture lysis and in both cases the blood cleared within 24 hours. Two cases had a marked elevation of the bleb over 360 degrees after suture lysis. In both cases, 5-fluorouracil had been used before suture lysis. In one case the excessive bleb persisted giving rise to a corneal dellen 6 weeks postoperatively. All eyes that were complicated by malignant glaucoma, iris incarceration, hyphaema, excessive bleb elevation, and corneal dellen had successful pressure outcomes.

Table 2 Success rates in the two groups 10 months after surgery

| Surgical success | Group with no suture lysis (n=101 (%)) | Group with suture lysis (n=99 (%)) | p Value |
|---------------------|---|---------------------------------------|---------|
| Unqualified success | 77 (76.2) | 72 (72.7) | NS |
| Qualified success | 12 (11.9) | 15 (15.2) | NS |
| Failure | 11 (9.9) | 12 (12.2) | NS |

NS=differences not statistically significant.

Table 3 Complications following suture lysis

| Complications | No of eyes (%) | MMC and/or 5-FU (No of cases) | Onset | Mean duration, days (range) | Management (No of cases) | IOP outcome* |
|--------------------------|----------------|-------------------------------|---------|-----------------------------|--------------------------|--------------|
| Flat anterior chamber | 13 (13.1) | MMC (2), 5-FU (3) | <72 h | 5.4 (1-21) | Medical (13) | 8S, 4Q, 1F |
| External aqueous leak | 9 (9) | 5-FU (2) | <72 h | 4.6 (1-14) | Medical (9) | 4S, 2Q, 3F |
| Malignant glaucoma | 2 (2) | MMC and 5-FU in one case each | <48 h | 5 and 7 | Medical (2) | 2S |
| Iris incarceration | 2 (2) | Nil | <24 h | Repaired at surgery | Surgery (2) | 2S |
| Hyphaema | 2 (2) | Nil | <1 h | 1 | Medical (2) | 2S |
| Excessive bleb elevation | 2 (2) | 5-FU (2) | <1 h | 7105 | Medical (2) | 2S |
| Corneal dellen | 1 (1) | 5-FU (1) | 6 Weeks | 14 | Medical (1) | 1S |

MMC=mitomycin C, 5-FU=5-fluorouracil. *S=unqualified success, Q=qualified success, F=surgical failure.

Surgical complications were also observed in the 101 eyes that did not require suture lysis. Seven per cent (seven) of these eyes had flat anterior chambers and in four of these eyes, anterior chamber reformation with air was performed. Three eyes developed prolonged hypotony; two of these eyes developed hypotonus maculopathy. Both eyes belonged to the same patient. This patient was a young woman with high myopia. Intraoperative mitomycin (0.5 mg/ml for 3 minutes) was used on one of her eyes. There were three eyes with prolonged external aqueous leaks requiring resuturing and or the application of histoacryl glue. One case of malignant glaucoma was observed. This eye was pseudophakic and ultimately required a pars plane vitrectomy to break the attack. There was one case of iris incarceration which was successfully managed with miotics. A needling procedure was performed in one eye to improve filtration 4 weeks postoperatively.

Discussion

Tight scleral flap trabeculectomy reduces the risk of early overfiltration with its associated complications of hypotony and a flat anterior chamber.³ Graded suture lysis following trabeculectomy has become an established procedure in the early postoperative period to titrate filtration. It is also commonly used in the management of failing filtering blebs.² The technique of suture lysis was first described by Lieberman with a Goldmann gonioscopes.¹ Hoskins and Migliazzo reported a new design for a lens to facilitate the procedure.² Both mildly compress the conjunctiva to expose the underlying suture. Others have reported similar success in performing suture lysis with the Zeiss four mirror gonioscopy lens,⁸ a disposable glass micropipette¹⁰ and a 20 gauge fibre optic endolaser probe.¹¹ More recently new lenses have been designed to facilitate the procedure.^{12 13}

The trabeculectomy success rate at 10 months as measured by IOP level was similar in the two groups. This was reassuring as suture lysis was performed for inadequate filtration. Both groups were similar with regard to most factors (Table 1) preoperatively and intraoperatively.

Complications following suture lysis have been reported previously. Savage *et al* reported three flat anterior chambers requiring surgical reformation of the anterior chamber and five eyes with conjunctival wound leaks following suture lysis in 43 eyes.³ Melamed *et al* reported

an 18% incidence of anterior chamber shallowing with one eye with lens corneal touch following suture lysis on the first postoperative day.⁴ Others have reported complications including malignant glaucoma,⁵ bleb leak with hypotony,⁶ hypotonus maculopathy,^{7 8} and progressive lens opacity.³ In this study we report a 13.1% flat chamber rate, 9% external leak rate, 2% malignant glaucoma rate, 2% iris incarceration rate, and 2% hyphaema rate. These complications represent a virtual doubling of the expected complication rate. In the non-lysis group flat anterior chambers occurred in 7% (seven) of eyes. With suture lysis this complication increased to 13% of eyes. Similar observations were noted in relation to the malignant glaucoma rate (2% versus 1%), iris incarceration (2% versus 1%), and external leaks (9% versus 3%).

Laser suture lysis is generally performed after the second postoperative day and before the end of the third postoperative week. Suture lysis performed after the third postoperative week, in eyes that have had trabeculectomies without mitomycin C, appears to have little effect.^{8 14} Trabeculectomies augmented with mitomycin C may have an extension of the window period, and successful suture lysis has been reported to occur up to 21 weeks postoperatively.¹⁵ A shallow or flat anterior chamber as referred to above is the most common complication of suture lysis; 13% of our cases developed this complication after the procedure. In all cases conservative management was successful. External aqueous leaks following suture lysis occurred in 9% of eyes at the conjunctival wound edge in trabeculectomies with fornix based conjunctival flaps. It is possible that trauma from the lysis lens may have initiated this complication at the time of suture lysis, however some leaks did not develop until 3 days after suture lysis. It is likely that the improved bulk flow of aqueous followed the path of least resistance after suture lysis and this was at the wound edge in the early postoperative period. Interestingly, antimetabolite therapy before suture lysis did not predispose to this complication. External leaks following lysis may be a prognosticator for eventual failure (33%).

Malignant glaucoma was observed in two eyes with pre-existing narrowed angles following suture lysis. One explanation for this development is that sudden ocular decompression in predisposed eyes may produce forward displacement of the lens-iris diaphragm leading to ciliary vitreous block.¹⁵ The development of this complication was

seen within 48 hours after suture lysis. As this is a potentially serious problem, close follow up of predisposed individuals (chronic angle closure and pseudoexfoliation cases) is recommended following suture lysis.¹⁵

Iris incarceration was the only complication following suture lysis which required surgical intervention.

As previously indicated, this group of 200 trabeculectomies originated from a tertiary care glaucoma practice comprising mainly cases referred for progressive glaucomatous optic neuropathy. A significant number of cases had previous ocular surgery. This series may therefore not represent a standard group of surgical cases. Approximately 50% (103 eyes) of all cases received either intraoperative or postoperative antifibrotic therapy. Of the 13 eyes that developed a flat chamber after lysis five received antifibrotic therapy suggesting an increased flat chamber rate within the suture lysis group. Although all cases responded to conservative therapy we urge caution with lysis in eyes that undergo antifibrotic therapy with trabeculectomy.

Postoperative complications in the non-suture lysis group were frequently the result of overfiltration (early flat anterior chambers, hypotony, and hypotonous maculopathy) and often required intervention. A total of 11 procedures were required to resolve postoperative complications in this group.

In conclusion, suture lysis is not an innocuous procedure. Complications may be observed in up to 30% of eyes undergoing this procedure. We continue to recommend tight scleral flap trabeculectomy with cautious suture lysis to titrate filtration. Close follow up is indicated as some complications develop 48

or even 72 hours after suture lysis. External leaks suggest possible late filtration failure. Patients requiring suture lysis achieve a final pressure response similar to patients with good early filtration.

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