

## Use of fibrin glue in lower blepharoplasties

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**SUMMARY.** This prospective study investigates the long-term appearance of the scar following closure of lower blepharoplasty incisions with the fibrin adhesive Tissucol® compared with the usual subciliary suturing. Eighteen eyelids closed with fibrin adhesive were compared with 12 eyelids where a 5-0 running suture was used for closure and to 10 eyelids that did not undergo surgery. The measurement team consisted of a panel, blind to patients and technique, that scored the scar morphology on a scale of 1-4. The Dunn test showed no difference between the group treated with the tissue adhesive and the group with conventional subciliary closure. There was a difference between the Tissucol® treated group and the control group ( $P < 0.01$ ). The surgical technique and the advantages in lower lid incision closure are discussed.

### INTRODUCTION

The use of surgical tissue adhesives in facial soft tissue surgery is attractive as it reduces the need for suturing and drains. Sutures may potentially cause problems if there is tissue incompatibility causing host tissue reactivity. Excessive tissue compression may also result in tissue damage and subsequent scarring. Epithelial cysts, granulomas and milia may complicate wound healing. By improved haemostasis of raw wound surfaces, which may compromise skin flap viability and lead to potential skin sloughing, haematoma formation is reduced. The use of surgical glue reduces the need for drains which adds to patient mobility and postoperative comfort.

Ideally, a surgical tissue adhesive should possess the following properties; biodegradability, good tissue compatibility, sufficient binding strength, adhesive and polymerisation ability in moist environments, good quality but low cost and ease of use with safety (Vobel et al., 1993). No currently available adhesive satisfies all the above criteria and surgical interest has concentrated principally on the cyanoacrylate derivatives (e.g. Histoacryl®, B. Braun AG, Melsungen) and the fibrin glue derivatives (e.g. Tissucol®, Tisseel®, Immuno N.V., Brussels). The use of Histoacryl® glue in facial plastic surgery has been advocated (Ellis and Shaikh, 1990), but care is needed in use near the eye to avoid corneal contact. If it is applied subcutaneously it may elicit an acute inflammatory reaction and cause foreign body giant cell reactions.

Fibrin has been used as early as World War I when it was applied for topical haemostasis in brain surgery (Grey, 1915). In World War II, its value for fixing skin grafts was recognised (Cronkite et al., 1944).

insufficient fibrinogen concentration in plasma meant that the fibrin film was not stable and so it was not widely accepted for clinical use (Goldfarb et al., 1943). The fibrinogen concentration has been successfully increased and using this fibrin sealant microvascular anastomoses and nerve transplantation have been performed (Matras, 1970; Matras et al., 1972, 1973, 1977). The use of fibrin glue in cosmetic facial surgery was advocated by Piechotta and Flemming in 1981 and Bruck in 1982, where their desire was to decrease postoperative patient discomfort following a face-lift by avoiding drainage systems and haematoma formation. Mandel (1990, 1992) used autologous fibrin glue and a minimal number of sutures to close blepharoplasty incisions.

In animal experiments, heterologous fibrin glue preparations elicited more pronounced connective tissue reactions and resulted in poorer apposition than homologous material (Matras et al, 1972). The aim of this study therefore was to investigate prospectively the long-term appearance of the scar following the closure of lower blepharoplasty incisions with the homologous fibrin adhesive Tissucol®. Sutured incisions were compared with incisions closed using this fibrin adhesive and a control group in a blind fashion. We report our experience with this fibrin glue and the resulting technical modifications in its use for closing lower blepharoplasty incisions.

### SURGICAL TECHNIQUE

In all cases, a standard blepharoplasty technique, with a skin-muscle flap and fat removal through two or three buttonhole incisions in the orbital septum was utilised. The exact amount of skin and muscle

requiring resection was determined by the conventional method of asking the patient to open his/her mouth and to look upwards. The skin was then redraped under lateral tension. The orbicularis muscle in the tip of the skin-muscle flap was anchored to the lateral orbital periosteum with one 4-0 polyglactin suture (Vicryl, Ethnor SA, Neuilly). At the end of the operation, the two horizontal wound edges, at the subciliary level, were lying passively against each other. The lateral oblique and the back-cut incision, when performed, were closed with interrupted 5-0 Ethilon (Ethnor SA, Neuilly) sutures. In one group, the subciliary wound line was closed with a running 5-0 Ethilon suture; in the other group, the skin-muscle flap was glued to the septum and the subciliary wound edges were approximated with the same fibrin glue. In the latter group, the subciliary incision was placed just below the cilia, since there was no intention to suture this wound. The patients received cooling for the rest of the day using two cooling masks (Migräne Maske, Russka).

The fibrin tissue adhesive component I consists of lyophilised human fibrinogen and an antifibrinolytic agent and component II of calcium chloride and bovine thrombin. Component II comes in two concentrations of thrombin (500 IU and 4IU/ml), resulting in a fast and a slow setting solution respectively. The polymerisation of fibrin tissue adhesive in a physiological sequence of events is a replica of the final common pathway of the coagulation cascade producing a fibrin clot. Application of the fast setting Tissucol® between the septum and muscle layers was sometimes troublesome when the conventional one canula-two syringe system with Duploject® clip (Immuno N.V., Brussels) was used. Careful approximation of the epithelial borders at the incision line also proved difficult, due to premature clotting in the canula. The procedure may be performed accurately if a two canula-two syringe system is used. The two canulas are bent so that their points are close together (Fig. 1). More recently we have been using a double lumen Duplocath™ 25 application catheter (Immuno N.V., Brussels), which is shortened to 2 cm (Fig. 2). There is sufficient time to approximate the wound edges carefully so that clotting in the needles or in the double-lumen catheter cannot occur. Generally 0.5 ml of the fast setting mixture is sufficient for both lower lids. We have also used a 50% mixture of the 4 and 500 thrombin solution. This results in a medium setting fibrin glue, which might be more convenient for the inexperienced operator. The slow setting mixture is unreliable for skin approximation.

Attention to detail in taping of the resultant wound is also important in our experience. The conventional Steri-Strip™ (3M, St Paul) is not used as it lacks elasticity. Six mm wide Suture Strip™ plus (Genetic Laboratories, St Paul) or Steri-Strip™ elastic (3M, St Paul) applied meticulously are essential for correct



Fig. 1 – Two canula-two syringe system in use. The two canulas are bent so that their points are close together. Clotting can only occur outside the canulas. In this way, the same system with 0.5 ml solution can be used for both sides.



Fig. 2 – A double lumen Duplocath™ 25 catheter shortened to 2 cm, when available, is ideal for exact application.

eyelid support and avoidance of ectropion (Edgerton, 1972) (Fig. 3).

## MATERIALS AND METHODS

The study group consisted of nine candidates for cosmetic lower eyelid surgery (18 eyelids) where Tissucol® was used to stabilise the subciliary wound edge approximation. There were eight females and

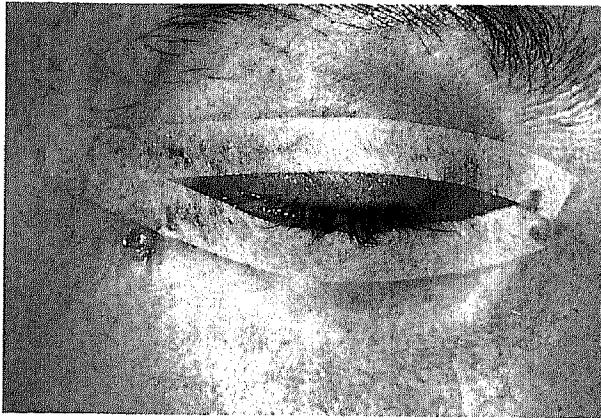


Fig. 3 – A 6 mm wide Suture Strip™ plus (Genetic Laboratories, St Paul) supports the eyelid for 3 days.

one male, with a median age at time of surgery of 35 years 8 months. Three had combined upper and lower eyelid surgery. Forehead and browlift procedures were performed in two patients (Mommarts et al., 1994). One patient had an infraorbital osteosynthesis plate removed in the same operating session. The reference group consisted of six patients (median age 43 years 5 months) with lower eyelid surgery (12 eyelids) where the incision was closed with a running 5-0 Ethilon suture. Three patients had upper and lower blepharoplasties done in the same session, one underwent an upper blepharoplasty at a later date. The surgical procedure, with the exception of the wound closure technique, was the same in both groups. All patients were operated upon more than 2 years previously for their lower blepharoplasty, assuring a mature scar (study group median 2 years 8 months [range 2.2–2.11], reference group: median 2 years 9 months [range 2.1–3.9]). The third group consisted of three non-operated individuals, and two patients operated on only the upper eyelids (median age 36 years 7 months).

The long-term postoperative morphology of the incision line was studied on 13 × 11 cm colour photographs. The frontal views 'eyes only, frontal gaze, no mimic' were used for this purpose. The two eyes were photographed separately. Accordingly, 38 lower eyelids could be judged.

A panel of five surgeons, two staff surgeons (SS), one visiting senior registrar (SR) and two residents (R) was assembled to reflect clinical opinion on scar aesthetics. The 38 pictures were randomly assigned a number between 1 and 100 and labelled on the reverse side. Each member of the panel carried out scoring on two occasions separated by not less than 2 weeks. The scoring system is displayed in Table 1. The examiner was asked specifically to judge only the appearance of the subciliary scar, not that of the lateral extension beyond the external canthus. On the second occasion, the pictures were randomly given another number. The data obtained were ana-

Table 1 – Scoring system for the subciliary scar

Scar	Score
No visible scar	1
Fine, linear scar	2
Light to moderate widening or hypertrophy	3
Unacceptable widening or hypertrophy	4

lysed using Spearman's rank correlation coefficient for intra- and inter-examiner reliability.

In order to provide an overall assessment of the subciliary scar, the two scores of each of the three examiners with the highest intra-examiner correlations were averaged. The three averaged scores were summed, and the results subjected to the Kruskal-Wallis and Dunn tests (non-parametric multiple comparisons for samples with unequal sizes). The statistical packages used were StatMost 2.5 for Windows (DataMost Europe, Porsgrunn, Norway) and Primer of Biostatistics 3.01 from Glantz (McGraw-Hill, New York, 1992).

## RESULTS

The intra-examiner correlations are summarized in Table 2 and ranged from 0.51 (SS2, R2) to 0.68 (SS1). Further analysis of data was performed with the scores of those three with the highest intra-examiner agreement (SS1, SR, R1). The inter-examiner correlations ranged from 0.39 (SS1 and R1, probability 0.011) to 0.66 (SS1 and SR, probability 0.000).

The individual average scores of SS1, SR and R1 for the same photograph were summed and this sum subsequently accorded to the identified patient and so to one of the three groups. By this means an overall consensus in terms of scar aesthetics was obtained. The Kruskal-Wallis test demonstrated a difference between the three groups ( $H = 11.113$ ,  $P = 0.004$ ). The results of the Dunn test are shown in Table 3. No differences could be detected between the group treated with the tissue adhesive and the group with conventional subciliary suture closure, and between the latter and the group without lower lid surgery. However, there was a difference between the Tissucol® treated group and the control group ( $P < 0.01$ ).

None of the photographs was given a score of '4'.

Table 2 – The intra-examiner correlations between the first and second scoring session of the photographs

Examiner	Correlation	Probability
Staff surgeon 1	0.68	0.000
Staff surgeon 2	0.51	0.001
Resident 1	0.62	0.000
Resident 2	0.51	0.001
Senior registrar	0.65	0.000

**Table 3** – Comparison of the scores in the three groups with Dunn's test

Comparison	Difference of ranks	SE	Q	P < 0.05
Group 1 (use of Tissucol®) versus group 3 (no lower lid surgery)	26.78 – 12.85 = 13.93	4.44	3.120	Yes
Group 1 (use of Tissucol®) versus group 2 (subciliary suturing)	26.78 – 17.46 = 9.32	4.19	2.223	No
Group 2 (subciliary suturing) versus group 3 (no lower lid surgery)	17.46 – 12.85 = 4.61	4.82	0.957	No

The lowest sum of the means was 3 (6 times score '1'). The highest possible sum of the means would be 9 (6 times '3'), but the highest computed was 6. Figures 4 and 5 demonstrate the scoring system in two 'Tissucol®' patients (minimum sum of means 3, maximum sum of means 6).

We had the clinical impression that bruising was considerably reduced in the group treated with the tissue adhesive, but no attempt was made to quantify length of ecchymosis in this study. Postoperative oedema was also impossible to quantify. Neither in the sutured nor in the Tissucol® treated group, did a haematoma occur.



**Fig. 4** – Eyelid with sum of mean scores 3, the lowest possible. Lower eyelids operated on at the age of 38 years, upper eyelids at the age of 39 years. The photograph was taken at the age of 41 years. The blepharoplasty was performed with the help of fibrin tissue adhesive.



**Fig. 5** – Eyelid with sum of mean scores 6, the highest computed value. Lower eyelid correction at the age of 35 years, brow and forehead lift at the age of 36 years. The photograph was taken at the age of 38 years. The blepharoplasty was performed with the help of fibrin tissue adhesive.

## DISCUSSION

Fibrin glue has been tested extensively in animal experimentation. There is no fundamental difference in wound healing between fibrinogen and suture-fixed flaps after extensive skin undermining, with total resorption of sealant after 5 days and good tissue compatibility (Piechotta and Flemming, 1983). Adhesive strength of wound sites has also been compared at sutured and glued sites in rat skin (Jorgensen et al., 1987). Higher bonding strength was present until 4 days postoperatively at the fibrin adhesive site and thereafter there was equivalent bonding strength at both sites.

Fibrin glue adhesives have been used extensively, mainly in Europe for over 10 years, in sensitive anatomical areas and are reported to be safe in use (Siedentop et al., 1983). Concerns have been expressed about their potential for the transmission of infectious diseases (Saltz et al., 1991), but no cases have been reported in the literature (Saltz, 1992). The human fibrinogen component is heat treated to 60°C and this inactivates the HTLV III virus. Rigorous screening of blood donors should also eliminate carriers of hepatitis. Furthermore, all Tissucol® kits marketed since January 1995 are subjected to a polymerase chain reaction test (Makris et al., 1993) for HTLV III, hepatitis B and C viruses, to exclude contamination with these viruses. However, these concerns have in the past concentrated research on the development of autologous fibrin tissue adhesives (AFTAS) (Siedentop et al., 1985). The major single disadvantage presently with AFTAS is their low adhesive strength, requiring adjunctive suture placement for adhesion. Because the adhesive strength of fibrin tissue adhesives is largely dependent on fibrinogen concentration, and there is inter-patient variation in this concentration, this is a source of unreliability in the use of AFTAS in the clinical setting. Mandel (1992) compared upper and lower blepharoplasties closed with AFTAS and minimal suturing to those closed with standard techniques (Rees, 1980). In the AFTAS group (32 patients, followed for 6–18 months) three wound dehiscences occurred and one patient developed a poor quality scar. None of the problems associated with suturing of milia, suture cysts or granulomas were noted. The fibrin glue also functioned well as a haemostatic agent although nothing is mentioned of bruising. In the sutured group (32 patients) no wound dehiscence occurred, but two patients had a poor quality scar and seven developed milia. We did not encounter any

wound dehiscence, poor quality scar or milia formation in our series.

The results of our study should be interpreted with caution. The sample is small and the photographs of both eyes of one patient were considered as separate data. Care was taken in standardizing the photographs. Nevertheless variations in film tint and head posture occurred. Patients were asked to remove subciliary eye liner. Residual mascara and the lateral scar may also have introduced a degree of bias.

The results of the analysis of the incisional scar morphology using the fibrin glue adhesive Tissucol® for closure in lower blepharoplasties are good, whilst morphometric findings do not characterize function, they do represent the essential background and prerequisite for adequate function. Toledo's (1983) observational findings regarding scar appearance could be confirmed. Wound closure in upper blepharoplasties using fibrin glue has not been attempted by us as the tension forces are perpendicular to the incision wound. In the upper lid we feel that more secure suture support is required to prevent potential dehiscence. Additionally, suture removal is not as painful in the upper as compared with that in lower blepharoplasties.

The only statistically significant difference that Sándor and Marchac (1994) noticed when comparing face lift with and without fibrin glue, was the decrease in the incidence of major haematoma formation and presentation of ecchymosis and oedema in the latter group. Although harder to judge objectively, we have the same clinical experience in blepharoplasty surgery, concerning ecchymosis.

## CONCLUSION

The use of fibrin sealant in lower blepharoplasties gives not only the advantage of a shorter operating time, but also of minimal postoperative ecchymosis. The postoperative course is, in general, free from complications. The subciliary incision can be placed very close to the cilia, making the scar less conspicuous. The sometimes painful subciliary suture removal is avoided and patients welcome the elimination of this procedure. This, and the reduction of postoperative bruising, largely contribute to patient comfort and quicker social re-integration. The resulting scar is not morphologically different to that of conventionally sutured lower blepharoplasties.

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