The Use of Fibrin Glue in the Correction of Pollybeak Deformity

A Preliminary Report

Krzysztof Conrad, MD, FRCS, FRCSC; Adi Yoskovitch, MD, MSc

Background: Supratip fullness, also known as pollybeak deformity, is one of the most common postoperative complications of rhinoplasty. The deformity can result from many different causes, some of which are related to the surgical technique and can be prevented. Poor re-draping of thick, inelastic skin and thick subcutaneous tissues over the reduced cartilaginous framework may result in the creation of a subcutaneous “dead space,” leading to the formation of excessive subcutaneous scar and a soft tissue pollybeak in some cases.

Objective: To evaluate the effectiveness of a homologous fibrin glue (Tisseel; Baxter AG, Vienna, Austria) in the prevention and correction of the soft tissue pollybeak deformity.

Design: Prospective study.

Patients and Methods: Thirty patients were treated with fibrin glue to achieve better adherence of the skin to the underlying skeletal framework. Ten patients had no previous nasal surgery. The remaining 20 patients presented with the complication of pollybeak deformity. In this group, 14 patients had undergone 1 previous surgical procedure, 3 had undergone 3 previous rhinoplasties, and 3 had undergone 4 or more previous procedures.

Results: There were no intraoperative or postoperative complications. Follow-up ranged from 2 to 34 months, with all patients achieving successful aesthetic outcomes.

Conclusion: Fibrin glue is an excellent adjunct to rhinoplasty procedures because it successfully eliminates the dead space that can cause soft tissue pollybeak deformity.

Arch Facial Plast Surg. 2003;5:522-527

ONE OF THE MOST common postoperative complications of rhinoplasty is the formation of supratip fullness, commonly referred to as pollybeak deformity because of its resemblance to the beak of a parrot. Characteristically, the nasal dorsum, just cephalad to the nasal tip, has a convex shape.

In this prospective study, we did not randomize the patients into a treated and controlled group. The selection of patients was based on criteria related to the type of skin and subcutaneous tissue or a history of surgery that had been complicated by a soft tissue pollybeak formation. In the former category, poor redraping of the skin noted before surgery confirmed the suspicion of a tendency to the soft tissue pollybeak deformity, justifying prophylactic use of homologous fibrin glue (Tisseel; Baxter AG, Vienna, Austria), but in the latter category, the use of fibrin glue was indicated as therapeutic. Under such circumstances, randomizing patients, especially after the initial encouraging results with the use of the tissue glue, posed an ethical dilemma.

Numerous factors have been considered in the pathogenesis of the pollybeak deformity, some of which are related to surgical techniques.\textsuperscript{1-4} Pathogenetic factors that are often associated with reduction rhinoplasty include overresectioning of the bony nasal dorsum, underresectioning of the cartilaginous nasal dorsum, and overzealous resectioning of the lower lateral cartilages in the area of the domes or medial crura, most of which can be summarized by the following well-known Simons equation: $\text{PB} = (\text{BHR}/\text{CHR}) \times (\text{ST}/\text{LSMC})$, where PB indicates pollybeak; BHR, bony hump removal; CHR, cartilaginous hump removal; ST, skin thickness; and LSMC, length and strength of the medial crura. Also, inadequate trimming of the vestibular mucosa during reduction of the tip projection may prevent good tip definition, resulting in a tendency to the pollybeak formation.
The technique-related causes are preventable, and we do not intend to dwell on them in this article. The complication that is most difficult to manage and most frustrating to the surgeon is the soft tissue pollybeak deformity, which is caused by poor redraping of inelastic skin at times in association with a significant thickness of subcutaneous tissue. Persistent postoperative edema in the supratip “dead space,” possibly leading to excessive subcutaneous fibrous tissue formation, can also be a contributing factor. The skin and subcutaneous tissue characteristics that are indicative of the likelihood of the soft tissue pollybeak formation can be usually assessed preoperatively, so an appropriate management plan should be designed beforehand. First of all, the patient should be educated about the limitations with regard to the possible surgical outcome. Such a management plan must include prophylactic adjustments in the surgical technique. Flimsyalar cartilages, even in the presence of adequate tip projection, will require strengthening with a columellar strut, and consideration should be given to a tip graft. Meticulous taping to reduce the supratip dead space is always crucial. An additional method using fibrin glue can facilitate tighter approximation of the soft tissue envelope to the understructure, based on experience with 30 patients, and has been found very valuable in preventing the pollybeak complication. The glue does not appear to facilitate skin redraping, which must be secured by adequate undermineing, and helps to obliterate the dead space by approximating the undermined skin to the underlying framework. It also reduces bleeding.

Fibrin glue mimics the last step of the blood coagulation process, resulting in the formation of a fibrin clot and subsequently in the creation of a biologic adhesive. It has been used successfully in numerous areas of medicine, including neurosurgery and cardiothoracic, craniofacial, maxillofacial, otolaryngological, and plastic surgery. It is used most frequently to create a watertight seal and to aid in hemostasis. By reducing hematoma formation, it improves the survival rate of skin grafts. To our knowledge, there has been no published study in which fibrin glue was used as an adjunct in the management (prevention and correction) of the soft tissue pollybeak deformity.

A prospective study was performed to evaluate the efficacy of fibrin glue in the prevention or correction of soft tissue pollybeak deformities. All patients scheduled for secondary rhinoplasty were analyzed as to the presence or absence of the soft tissue pollybeak deformity. The patients undergoing primary surgery were assessed for the presence of anatomical characteristics of the skin or subcutaneous tissues that would predispose them to supratip fullness. Those identified as having the deformity, or being in the risk category, were included in the study group. Then, their records were reviewed for previous procedures, postoperative complications, and final outcome. The procedures were performed with the patients under general anesthesia with endotracheal intubation. Endonasal technique with delivery of the lower lateral cartilages was used in all but 3 patients in the revision group who underwent open rhinoplasty. In the primary cases, the technique was routine, with the exception of wider skin undermining and meticulous subcutaneous soft tissue reduction. In the revision group, the supratip changes contributing to pollybeak were identified. Based on the cause, the deformity was addressed via excision of excessive subcutaneous scarring, reduction of the cartilaginous dorsum, augmentation of the bony dorsum, or adjustments to the lower lateral cartilages and the tip support. On completion of the necessary procedures, the marginal and intercartilaginous incisions, as well as the septal incisions (either hemitransfixion or complete transfixion), were closed with interrupted 4–0 chronic catgut sutures. Adhesive tape was then applied, and 0.50 mL of fast-bonding fibrin glue was injected between the interrupted sutures of the intercartilaginous incision into the interface between the dorsal skin and the underlying framework. Firm pressure was applied to the supratip area by means of a gauze dressing for 1 to 2 minutes, with manual evacuation of any excess fibrous gel. At the end of the application period, good adhesion was ensured, and nasal packing and a plaster nasal cast were applied. In the most recent 10 cases, the nasal packing was introduced before injection of the fibrin glue for better support within the nasal vestibulum while pressure was applied on the skin from the outside. The nasal packing was removed after 24 hours, and the cast was removed after 7 days.

RESULTS

A total of 30 patients (26 women and 4 men) were treated with fibrin glue to achieve better adherence of the skin to the underlying layers. The patients ranged in age from 19 to 47 years. An endonasal technique was used in 27 patients. Three patients underwent external approach septorhinoplasty; 10 patients underwent primary rhinoplasty; 14 patients were referred for secondary rhinoplasty (Figure 1); 3 patients were referred for tertiary rhinoplasty; and 3 patients were referred after undergoing more than 3 previous operations (Figure 2). In all primary rhinoplasties, meticulous removal of fibrofatty subcutaneous tissue in the supratip area was carried out, and special care was taken not to damage the undersurface of the dermis. In the revision cases, the same utmost care was taken with regard to the undersurface of the dermis during removal of subcutaneous scar tissue. There were no intraoperative or postoperative complications related to the use of the fibrin glue. Follow-up ranged from 2 months to 34 months. The supratip deformities were treated successfully in all 30 patients. A successful result was defined as either absence of a pollybeak, with good tip definition, or a significant improvement as determined by patient satisfaction and the surgeon’s assessment (Figure 3). Two patients required further revision to improve symmetry of the bony pyramid.

The soft tissue pollybeak deformity is a postoperative complication of rhinoplasty that in many cases can be attributed to the formation of a dead space between the skin and the cartilaginous infrastructure of the nasal skeleton. The skin and soft tissue contribute to what is referred to as the skin–soft tissue envelope. A surgically altered nasal skeleton may lack the necessary strength required to support the skin–soft tissue envelope. As a result, distortion may be caused by the forces of scar contracture over a poorly supported nasal tip, leading to its poor definition. Scar formation below the skin–soft tissue envelope and within this dead space may cause a char-
acteristic soft fullness of the nasal dorsum to occur (Figure 4). This parrot beak–shaped supratip is a significant aesthetic detractor.

Treatment of this complication involves both addressing the cause of the pollybeak deformity and eliminating the dead space. Guyuron et al,4 in an extensive review of supratip deformities, outlined a detailed method for dealing with the problem. In primary rhinoplasty, good tip definition and prevention of a pollybeak deformity can be achieved by the removal of the excess supratip cartilaginous dorsum and/or an increase in the tip projection. In cases in which overresection of the bony dorsum occurs, or a significant thickness of the nasal skin does not allow adequate lowering of the supratip dorsum, bony dorsal augmentation may be necessary. If excessive supratip fullness is the result of cephalically oriented lateral crura of the alar cartilages, the best approach is to reposition and trim the cartilage. In instances of underresection of the cartilaginous nasal septum, further excision is indicated. Cases in which there is adequate lowering of the cartilaginous dorsum, with adequate tip projection, and in which exuberant scar formation has occurred can be treated with simple scar excision. It should be noted that careful attention should be paid to avoiding injury to the dermal and subdermal plexi, as damage to the vascular supply can result in injury to the overlying skin, perhaps exacerbating the supratip fullness or causing permanent cutaneous scarring. A supratip stitch may be used to oppose the layers.10 The use of triamcinolone injections for a period of weeks to months after the revision may be of benefit in such cases.3,11 Taping and splinting of the region may also be beneficial. Although we have used the techniques of injection and splinting, we believe that the use of fibrin glue as an adjunctive procedure may eliminate the need for a lengthy period of injections, which is often required, and it may even eliminate the need for injections altogether. It should be noted that triamcinolone injection is not without its own complications. Although rare, subdermal atrophy, with resultant skin depression, telangiectasia formation, and pigmentary changes of the overlying skin, can occur.1,3 Adequate skin undermining to facilitate redraping and proper splinting and taping are still of great utility in preventing and managing pollybeak formation.

To address the prevention of the pollybeak deformity in the current study, the aforementioned techniques were used. In addition to these, fibrin glue was applied to the interface between the overlying skin and underlying skeleton. Like other fibrin glues, the homologous fibrin glue that was used in this study consists of 2 components, which when mixed together result in the

Figure 1. A, C, E, and G, Preoperative photographs of a 35-year-old woman after nasal trauma and 2 previous septorhinoplasties. Prominent nasal soft tissue pollybeak deformity was diagnosed along with a thick-skin subcutaneous tissue envelope. B, D, F, and H, Photographs taken 1 year after external approach septorhinoplasty with the use of homologous fibrin glue (Tisseel; Baxter AG, Vienna, Austria) to obliterate supratip “dead space” after extensive subcutaneous scar excision. Repair of lateral crus of the alar cartilages with cartilaginous grafts was performed along with a high-density porous polyethylene columellar strut. A 2-mm biocompatible synthetic implant (expanded polytetrafluoroethylene) was used to augment the bony dorsum. An open approach was used.
formation of a watertight biologic sealant. The first component consists of fibrinogen as well as calcium chloride, factor XIII, and various plasma proteins. The second component is bovine-derived thrombin and an antifibrinolytic agent in the form of aprotinin. The result of the mixture of the 2 separate components is the formation of a fibrin clot. The subsequent polymerization and reorganization of the fibrin clot are eventually followed by degradation and resorption. With the use of the fibrin glue, the potential dead space between the cartilaginous framework and the soft tissue layers was avoided. Furthermore, because the fibrin glue is a hemostatic agent as well, accumulation of blood or other tissue fluids in the tissue planes is prevented. As seen in the current study, all patients had complete resolution or improvement of their supratip deformity.

The use of fibrin glue in various medical fields, including microsurgery, nerve anastomosis, and cardiac surgery, is well documented. It has also been successfully used in plastic and reconstructive surgery. Mandel observed its application as an alternative method of wound closure in blepharoplasty. Man et al. noted the utility of fibrin glue in sealing capillary beds and minimizing postoperative bleeding, while improving surgical flap adherence to the recipient bed. In forehead and face-lift procedures in which fibrin glue was used, a similar effect of decreased hematoma formation, as well as decreased postoperative edema and bruising, has also been observed. Fibrin glue has also been used to stabilize chondrocytes in cartilaginous reconstruction. Its application has been favorable in fixation during endoscopy of the forehead.

The limitations of fibrin glue are few. Cost of the material is a consideration. There is also an associated preparation time of approximately 20 minutes, but this problem can easily be overcome by correct anticipation of the time at which it will be used. A more theoretical risk involves transmission of a viral disease. Fibrin glue is prepared from pooled blood products; therefore, there is a theoretical risk of transmission of hepatitis or human immunodeficiency virus. However, to date, no cases of viral transmission have been reported, to our knowledge. The risk can be completely eliminated with the use of autologous fibrin glue, which uses the patient’s own blood products to harvest the fibrin material.

CONCLUSIONS

The pollybeak deformity represents an important challenge in revision rhinoplasty. The causes, which are nu-

Figure 2. A, C, E, and G, Preoperative views of a 21-year-old man with a history of 3 previous septorhinoplasties showing soft tissue pollybeak deformity with underprojected nasal tip and stiff, thick nasal skin. B, D, F, and H, Photographs taken 10 months after open approach septorhinoplasty with excision of excessive scarring of supratip, columnellar strut (high-density porous polyethylene), tip lobule shield cartilage graft, and 2-mm bony dorsum (expanded polytetrafluoroethylene) augmentation. Homologous fibrin glue (Tisseel; Baxter AG, Vienna, Austria) was used to prevent formation of a “dead space” following supratip scar excision.
merous, include overresection or underresection of the nasal dorsum, inadequate tip support, and exuberant scar formation within a dead space below the thick, rigid skin tissue envelope. In addressing the pollybeak deformity, the surgeon would be well advised to identify the cause of the problem on an individual patient basis. In the current study, fibrin glue was used to complement existing, sound methods for correcting the deformity. In cases involving correction of supratip fullness, fibrin glue serves as an adjunct, helping to eliminate the subcutaneous dead space.

The experience of the senior author (K.C.), which is based on 30 years of rhinoplastic surgery and which focused equally on primary, secondary, tertiary, and post-

Figure 3. A, C, E, and G, Photographs of a 25-year-old woman taken after 2 previous rhinoplasties complicated by a soft tissue pollybeak deformity. B, D, F, and H, Photographs taken 1 year after tertiary septorhinoplasty. Correction by cartilage delivery approach. Columellar high-density porous polyethylene strut with excision of supratip soft tissue was used with application of fibrin glue (Tisseel; Baxter AG, Vienna, Austria).

Figure 4. Routine formalin-fixed hematoxylin-eosin–stained microscopic sections. Thickened collagen fibers separated by mild edema, entrapped adipose tissue, and enlarged reactive-appearing fibroblasts are evident. Prominent telangiectatic capillary blood vessels are seen lined by swollen endothelial cells. Rare foreign body multinucleated giant cells are present. There are no features of keloid (original magnification ×40 [A] and ×310 [B]).
multiple revision procedures, underscores the difficulties involved in achieving good nasal tip definition in some cases. This problem continues to frustrate rhinoplastic surgeons despite the introduction of many surgical maneuvers that can be used to achieve good tip projection, support, and definition. Based on the results obtained in the 30 cases discussed in this article, 2 of which were our own revision cases, we believe that fibrin glue can play an integral role in the management of the pollybeak deformity and should be considered a fundamental part of the armamentarium of a rhinoplasty surgeon.

Accepted for publication June 10, 2003.

This study was presented at the Eighth International Symposium of Facial Plastic Surgery; May 1-5, 2002; New York, NY.

The production of the homologous fibrin sealant (Tisseel) that was used in this study is carried out according to Immuno Plasma Safety guidelines, which are recognized by the World Hemophilia Society, US Congress, and European Parliament. According to the manufacturer’s records, “with more than 5 million applications administered over two decades internationally, not a single confirmed case of viral transmission has been detected.” Full documentation of the study records is available through Baxter AG, Vienna, Austria, the manufacturer of Tisseel.

We extend sincere thanks to John Doucet, MD, FRCPC, York Central Hospital, Richmond Hill, Ontario, for processing and interpretation of the histologic specimens shown in Figure 4.

Corresponding author and reprints: Krzysztof Conrad, MD, FRCS, FRCSC, 131 Hazelton Ave, Suite 201, Toronto, Ontario, Canada M5R 2E4 (e-mail: info@drkconrad.com).

REFERENCES


Quotable

Rhinoplasty is the thinking surgeon’s operation.
Jack Anderson, MD, 1986