Presentation Patterns and Surgical Management of the Complications of Thread Rhinoplasty

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CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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AUTHOR CONTRIBUTIONS

Conceptualization: HRJ. Data curation: HRJ, SJK. Methodology: HRJ, SJK. Project administration: HRJ. Writing–original draft: HRJ, SJK. Writing–review & editing: HRJ, SJK.
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Abstract

Objectives. Nonsurgical rhinoplasty using threads has gained popularity in recent years. While the benefits of this procedure are being emphasized, possible complications and their management are not well-known. This study aimed to present the surgical management and results of the complications of thread rhinoplasty.

Methods. We retrospectively reviewed the medical records of seven patients who underwent revision rhinoplasty due to the complications of thread rhinoplasty from January 2018 to May 2021. The presentation of complications, detailed surgical procedure, and the outcomes of revision rhinoplasty were reviewed.

Results. Visible or extruded threads at the tip were the most common complication, followed by dorsum irregularity. All the threads were not absorbed and intact in shape, even several years after insertion. Thread removal required careful tissue dissection, resulting in the loss of tip support and dorsal irregularity. To restore the tip support and camouflage the dorsum shape, an autologous tissue graft was required.

Conclusion. Removal of threads at the tip and dorsum accompanied structural weakening and partial tissue loss, which required tip support restoration and dorsum camouflage.

Keywords. Rhinoplasty; Minimally Invasive Surgical Procedures; Polydioxanone; Complications; Revision Surgery
HIGHLIGHTS

The common complication of thread rhinoplasty was the visible or extruded threads at the tip.

All the threads were not absorbed and intact in shape, even several years after insertion.

Thread removal needed tissue dissection, resulting in tip support loss and dorsal irregularity.

Revision rhinoplasty after thread removal requires tip support restoration and dorsum camouflage.
INTRODUCTION

Since absorbable threads were first used for facelifts in the late 1990s [1], the use of threads was subsequently extended to rhinoplasty, and became highly popular with the trend of favoring minimally invasive procedures in facial aesthetic surgeries [2]. A synthetic, absorbable, monofilament polydioxanone (PDO) suture, which is slowly absorbed by hydrolysis over several months, is most commonly used in thread rhinoplasty [3]. It has a barbed structure, such that the multiple barbs are caught by tissue fibers and thus can firmly attach [4]. The threads can be inserted in the nasal dorsum, nasal tip, or both, with several threads inserted in each structure. For improved aesthetic outcomes, thread rhinoplasty is commonly combined with filler injection or fat grafting to supplement the deficient volume [4-6]. This nonsurgical rhinoplasty using barbed threads is emphasized as a safe and straightforward procedure free from anesthesia, recovery process following surgery, and surgery-related complications. Therefore, thread rhinoplasty is currently widely performed in daily practice.

Several studies reported techniques and the surgical outcomes of the nonsurgical rhinoplasty using barbed threads [4,5,7]. They noted that the thread rhinoplasty is an effective alternative to conventional rhinoplasty, with high patient satisfaction and no or few minor complications. While the benefits of thread rhinoplasty are being emphasized, its complications tend to be overlooked [8]. Only a few studies reported complications of thread rhinoplasty, and they were limited to inflammation or infection cases [9,10]. Some patients in that report experienced severe infection, including abscess and skin necrosis with an open wound [9]. However, other complications, such as thread extrusion, palpable threads, or aesthetic dissatisfaction, have not been reported. Surgical techniques and considerations in
revising those cases have never been reported, despite their clinical importance. As thread rhinoplasty becomes popular, these complications also increase, and the demand for revision surgery will also increase.

In this study, we reviewed the case series of revision rhinoplasty performed due to the complications of thread rhinoplasty, and reported the presentation patterns of the complications, the surgical management, and its outcomes.

MATERIALS AND METHODS

This study is a retrospective review of patients who underwent revision rhinoplasty for the complications of thread rhinoplasty, performed by Dr. Hong Ryul Jin at Dr. Jin’s Premium Nose Clinic in Seoul, Republic of Korea. The study was approved by the institutional review board of the National Medical Center (IRB number, 2021-0292-001). The informed consent was waived due to the retrospective nature of the study. However, written informed consent for the use of pre/postoperative facial photographs was obtained from all patients before surgery with a full explanation.

Seven patients who underwent revision rhinoplasty due to complications and/or aesthetic dissatisfaction after thread rhinoplasty from January 2018 to May 2021 were analyzed (Table 1). They comprised six females and one male, and their mean age was 26±6 years (range, 18–36 years). The patients had a history of thread rhinoplasty at various clinics. We reviewed the medical record to obtain the following information: chief complaint, the reason for seeking revision rhinoplasty, time of thread insertion, and accompanied procedures with thread insertion. Status of the thread (shape and degree of absorption), location, number of inserted threads, and the degree of adhesion with the surrounding tissues were analyzed with operative
photos and surgical records. Detailed surgical techniques, the type of autologous tissue used for revision, and any significant findings during the surgery were also recorded and reviewed. The surgical outcome was measured as patient satisfaction with categorical variables (very satisfied, satisfied, and dissatisfied).

For statistical analysis, a descriptive analysis was performed using SPSS version 27.0 software (IBM Corp., Armonk, NY, USA).

RESULTS

Presentation patterns and treatment outcomes
From thread insertion to revision surgery, the mean duration was 3.54±3.04 years (range, 2 months–7 years). Six out of seven patients had thread insertion both at the tip and dorsum. The primary reasons for revision were the visible or extruded threads at the tip (five patients), palpable thread on the dorsum (one), and other aesthetic issues (one). One patient experienced thread extrusion at the tip, bilateral vestibules, and membranous septum. Another complained of pain along the site of thread insertion. Most patients wanted to correct the combined aesthetic issues, including bulbous and under-projected tip, deviated or hump nose, along with the thread removal.

Patients were followed up postoperatively from 7–48 months after revision rhinoplasty. Six patients were satisfied with the outcomes of revision rhinoplasty. However, one needed minimal touch-up with filler to fill the slight depression on the mid-dorsum.

Surgical findings of revision rhinoplasty
 Threads were removed from both the tip and dorsum in six patients, and from the tip only in
one patient (Table 1). The mean number of threads removed from both the tip and dorsum was 14.67±3.83 (range, 10–21). The number of threads removed from the tip only was five. The threads were barbed in all patients and dyed in four patients. Dyed threads were easier to locate than the non-dyed, white threads. All the threads were almost intact in their original shape with cogs, and minimal to no resorption was observed even several years after insertion. After the thread removal, weakened tip support and dorsal irregularities were observed in all cases.

**Surgical techniques of revision rhinoplasty**

In all patients, an open rhinoplasty approach was performed under general anesthesia to efficiently remove the threads and perform the necessary techniques to achieve the aesthetic goals. Threads inserted in the tip area were easily identified after the skin flap elevation, which were easily removed after interdomal dissection. However, multiple long threads inserted into the level of the anterior nasal spine required deep dissection for removal. The soft tissue attached to the threads was inevitably removed, resulting in the loss of tip support.

Dorsal threads required careful dissection, because they were embedded within the scarred subcutaneous tissues, and granulation tissue was often observed around them. The threads in thin-skinned patients were easily located, while it was difficult in thick-skinned patients. After identifying the threads and dissecting the soft tissue around them, pulling them out using mosquito forceps was attempted. However, attention was required, because pulling the threads could cause soft tissue damage. If resistance with skin retraction was felt when the threads were pulled, careful dissection was performed to prevent inadvertent skin damage. After removing all the threads, careful evaluation of the nose shape was required. Any dorsal irregularities or dimpling were restored using an autologous tissue graft. Minor dorsal
irregularities were camouflaged with soft tissue, such as the temporalis fascia or postauricular soft tissue, while a significant depression was filled with cartilage graft. The lost tip support was restored with either a columellar strut or septal extension graft with a tip onlay graft.

Materials for the graft or soft tissue reinforcement depended on the anatomical abnormalities after thread removal and the patient’s aesthetic demands. Minor changes were achieved using septal or conchal cartilage. Restoring major depression or augmentation of the dorsum to a higher level than the preoperative dorsal height required autologous rib cartilage.

Case 1.

A 26-year-old female visited our clinic for thread removal in her nose inserted 7 years ago at another local clinic. A small bluish dot was observed at the nasal tip (Fig. 1A-D). She complained of pain with palpation of the tip and dorsum. The tip was difficult to palpate due to tenderness. The irregular, slightly bluish thread lines, which were palpable and movable with skin stretching, were observed on the dorsum.

With an open approach, revision rhinoplasty with thread removal was performed. After the skin flap elevation, the protruding, navy blue colored, thick threads were easily identified at the dome (Fig. 2A-B). Further dissection between the medial crura revealed the threads deeply inserted into the anterior nasal spine (Fig. 2C). With careful dissection, all the threads at the tip were removed completely (Fig. 2D). However, the tip support became weak, and the projection decreased after thread removal.

Similar to the tip area, the dorsal flap elevation revealed multiple barbed threads incorporated into the soft tissue of the dorsal skin. Threads were dispersed in the entire area of the dorsum. Therefore, they required careful soft tissue dissection until the threads were removed without resistance using mosquito forceps. The dorsum demonstrated depression
with irregularities after all the threads were removed (Fig. 2E).

Tip projection was restored with a columellar strut and onlay graft using septal cartilage, and subsequently covered with postauricular soft tissue. Dorsal depression with irregularities was camouflaged using septal cartilage and postauricular soft tissue. The patient was followed up until 13 months after surgery and was highly satisfied with the surgical outcome (Fig. 1E-H).

Case 2.

A 27-year-old female visited our clinic for aesthetic improvement of her nose. She underwent thread rhinoplasty at another clinic several years ago to improve the shape of the dorsum and tip, which resulted in unsatisfactory aesthetic outcomes. Threads were palpable on the dorsum, which were deviated to the right side, and the tip appeared bulbous (Fig 3A-D).

Revision rhinoplasty with thread removal was performed with an open approach. Multiple transparent threads incorporated into the soft tissue of the tip and dorsum were removed (Fig. 4A-B). After the thread removal, the tip support weakened, and dorsum irregularity developed.

Tip onlay graft was performed using harvested conchal cartilage. Depressed and irregular dorsum was camouflaged with conchal cartilage and folded temporalis fascia. Ten months after surgery, the deviated dorsum and the tip bulbosity improved (Fig. 3E-H), and the patient was highly satisfied with the surgical outcome.

DISCUSSION

One notable aspect of our study was that the threads did not resorb even years after insertion.
In most patients, the threads maintained their original shape and volume with intact cogs. It is known that the PDO threads used in thread rhinoplasty are absorbed into the tissue gradually by hydrolysis [3]. An animal study using pigs revealed that the inserted threads became fragmented by 24 weeks and completely dissolved by 48 weeks [11]. In this experimental study, USP 4-0 non-barbed PDO threads were inserted separately with a 1-cm interval. Histological changes of the surrounding tissues after threads insertion included collagen production, the development of new fibrous connective tissue which merged with existing tissue, fat reduction, tissue contracture, and improved vascular supply [11]. A rat model study using four different PDO thread types (single-stranded, 4-stranded, 12-stranded, and barbed cog thread) also demonstrated similar tissue response, collagen formation, and 24 weeks for degradation [12]. Factors contributing to these tissue changes have not yet been elucidated.

On the other hand, possible explanations for the intact threads even years after surgery in our cases are as follows: First, although threads were made of absorbable components, thick threads rarely dissolve in the nose tissue, where the soft tissue layer is rather thin. Second, when the filler is used concurrently with PDO threads, hyaluronic acid has been reported to block the chemical reaction between PDO and water, thereby prolonging the life of the PDO threads [6]. In our series, the combined use of fillers was unclear due to the lack of medical records. Third, non-absorbable threads or a combination of absorbable and non-absorbable threads might have been used in the previous surgery. One study reported a complication with a non-absorbable thread, such as polypropylene [10]. In Korea, a non-absorbable polypropylene product named Everko (Dongbang Medical, Seongnam-si, Gyeonggi-do, Republic of Korea) was once commercially available for thread rhinoplasty.

Thread exposure at the tip is mostly caused by a wrong insertion technique. To prevent the thread extrusion at the tip, they must be inserted deep in the tissue between the medial
crura and should not reach higher than the intermediate crus, retaining enough cushion layer on the top of its upper end [6]. If the thread is not inserted deep enough or a longer thread is inserted, the chance for extrusion or visible thread at the tip skin increases. Because the tip is a mobile portion with relatively poor blood circulation, an improper insertion technique inevitably results in pain, thread exposure, or infection [9]. With the removal of the tip threads, tip projection often decreases. When multiple threads are removed by deep intercrural dissection, the tip support is lost due to weak medial crura with a slight loss of intercrural tissue. Tip support must be restored either with a columellar strut or septal extension graft for an improved aesthetic result. In our series, all patients needed tip support restoration using a combination of a columellar strut, septal extension graft, and onlay graft. In our series, thread removal on the dorsum was inevitably accompanied by a slight tissue loss and dorsal irregularity, especially in thin-skinned patients. The patterns of thread cogs grasp the tissue firmly and prevent extrusion. This advantage may act as a disadvantage when removing the threads. Tissue adhered to the cog prevents slippage of the thread. Therefore, removal is only possible with careful tissue dissection. This may cause a slight tissue loss on the dorsum and dorsal skin irregularities. Because most patients wanted a raised bridge or at least a regular dorsum after thread removal, dorsal camouflage or augmentation was necessary to achieve an improved dorsal shape. For the natural-looking camouflage, soft tissue such as the fascia or perichondrium was helpful [13]. We used the temporalis fascia in two patients, the postauricular soft tissue in one and rib perichondrium in another for the dorsal skin camouflage.

Although our series did not have such cases, severe infections, including abscess and skin necrosis with an open wound, were also reported [9]. Suggested factors contributing to infection are the previously inserted allograft, insertion of too many threads, absence of...
aseptic preparation, anatomical features, and properties of PDO threads that high absorbability increases the inflammation around the threads [9]. Absorbable PDO has hydrophilic properties and therefore showed a more severe tissue inflammatory reaction than non-absorbable threads [10]. All previously reported infections occurred when PDO threads were used [9,10].

It is not clear how many thread insertion is ideal. In the previous studies describing the surgical technique of thread rhinoplasty, the authors described different numbers of threads on the dorsum and the columella [4-6]. The number of inserted threads can be influenced by skin thickness, types of threads, combined fat grafting, or hyaluronic acid filler injection. Most reports showed 2-5 threads on the dorsum and 2-5 threads on the columella; thus, 4-10 threads in total [4-6]. Additional two threads were inserted per each alar rim to reduce the nostril show as necessary [4]. Our case series showed an average of 14.67± 3.83 threads (range, 10-21), which is much more than previous studies describing the surgical technique (range, 4-10) [4-6].

Thread rhinoplasty can be an effective way to increase mild tip ptosis, or when a slight volume increase of the dorsum is needed in thick-skinned patients. However, surgical rhinoplasty using grafts would be the choice when a considerable change of the tip projection or dorsal height is required. In our case series, many threads were overly inserted into the tip and the dorsum to achieve considerable change, and these overdone procedures resulted in complications. Although thread rhinoplasty is a simple procedure that can be performed in an outpatient clinic with minimal anesthesia, the surgeon should be aware of the proper techniques, limitations, and possible complications of thread rhinoplasty.

This study has limitations, as it is a small case series with limited information on the previous procedures. Further studies with a larger case series and more information regarding
the previous thread insertion are needed. Nevertheless, this study is the first case series reporting detailed surgical techniques and considerations in revision rhinoplasty for the complications of thread rhinoplasty, and would help both patients and surgeons to recognize the risks of thread rhinoplasty and their surgical management.

In this case series of complications of thread rhinoplasty, we found that the threads maintained their original shape without undergoing resorption even after years of insertion. Thread removal required careful dissection due to adherent tissue around the cog, inevitably causing a slight loss of the surrounding soft tissue with structural weakening. Reinforcement of the tip support and camouflage of possible dorsal irregularity are the key procedures for an improved aesthetic outcome.
REFERENCES


**Figure legends**

**Fig. 1.** 26-year-old female patient presented with pain and visible threads at the nasal tip (Case 1). Before (A-D) and 6 months after revision rhinoplasty (E-H).

**Fig. 2.** Intraoperative findings of Case 1. (A) The threads are visible as a bluish dot at the nasal tip (red arrow). (B) After the skin flap elevation, multiple thick, dyed threads are easily identified between the intermediate crura. (C) Further dissection into the intercrural space shows that the threads are deeply inserted into the anterior nasal spine. (D) Multiple barbed threads were removed from the tip and the dorsum. The threads are intact in their original shape even 7 years after insertion. (E) The dorsum shows depression with irregularities after all the threads were removed (red line and red arrowheads).

**Fig. 3.** A 27-year-old female patient complained of a bulbous tip with skin dimpling at the tip (Case 2). Before (A-D) and 10 months after revision rhinoplasty (E-H).

**Fig. 4.** Intraoperative findings of Case 2. (A) Multiple transparent threads incorporated into the soft tissue of the dorsum are observed (black arrowheads). (B) Removed threads.
<table>
<thead>
<tr>
<th>Sex/Age</th>
<th>Reasons for revision</th>
<th>Time from thread insertion (years)</th>
<th>Number of threads removed</th>
<th>Thread type</th>
<th>Insertion site</th>
<th>Thread status</th>
<th>Graft material</th>
<th>Used techniques for revision rhinoplasty</th>
<th>Follow-up (months)</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>F/26</td>
<td>Visible threads at the tip, pain</td>
<td>7</td>
<td>21</td>
<td>Barbed, dyed</td>
<td>Dorsum, tip</td>
<td>Intact</td>
<td>Septal cartilage, postauricular soft tissue</td>
<td>Dorsal onlay graft, columellar strut, tip onlay graft, camouflage with soft tissue (tip, dorsum)</td>
<td>13</td>
<td>Very satisfied</td>
</tr>
<tr>
<td>F/27</td>
<td>Deviated, palpable dorsal threads, bulbous tip</td>
<td>N/A</td>
<td>17</td>
<td>Barbed, dyed (2) and undyed (15)</td>
<td>Dorsum, tip</td>
<td>Intact</td>
<td>Conchal cartilage, temporalis fascia</td>
<td>Dorsal onlay graft, tip only graft</td>
<td>16</td>
<td>Very satisfied</td>
</tr>
<tr>
<td>F/32</td>
<td>Bulbous tip, low dorsum, deviated septum</td>
<td>2</td>
<td>14</td>
<td>Barbed, undyed</td>
<td>Dorsum, tip</td>
<td>Intact</td>
<td>Autologous rib, perichondrium</td>
<td>Dorsal onlay graft, revision septal reconstruction, septal extension graft, camouflage with perichondrium (dorsum)</td>
<td>25</td>
<td>Very satisfied</td>
</tr>
<tr>
<td>M/36</td>
<td>Thread extrusion at the tip and the vestibule</td>
<td>5</td>
<td>13</td>
<td>Barbed, dyed</td>
<td>Dorsum, tip</td>
<td>Intact</td>
<td>Autologous rib, perichondrium, septal cartilage</td>
<td>Dorsal onlay graft, columellar strut, tip onlay graft, LLC onlay graft,</td>
<td>40</td>
<td>Very satisfied</td>
</tr>
<tr>
<td>Patient ID</td>
<td>Condition Details</td>
<td>Follow-Up</td>
<td>Thread Type</td>
<td>Area</td>
<td>Cartilage</td>
<td>Procedure Details</td>
<td>Duration</td>
<td>Satisfaction</td>
<td></td>
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<tr>
<td>F/21</td>
<td>Visible threads at the tip, with skin dimpling, hump</td>
<td>N/A</td>
<td>Barbed, dyed</td>
<td>Tip</td>
<td>Intact</td>
<td>Septal cartilage, camouflage with perichondrium (tip, dorsum)</td>
<td>48</td>
<td>Very satisfied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/18</td>
<td>Visible dorsum threads, hump, deviated nose</td>
<td>2 months</td>
<td>Barbed, dyed</td>
<td>Dorsum, tip</td>
<td>Intact</td>
<td>Septal cartilage, temporalis fascia</td>
<td>Dorsal onlay graft, spreader graft, septal extension graft, tip onlay graft</td>
<td>18</td>
<td>Added filler at mid-dorsum</td>
<td></td>
</tr>
<tr>
<td>F/27</td>
<td>Visible threads at the tip</td>
<td>N/A</td>
<td>Barbed, dyed</td>
<td>Dorsum, tip</td>
<td>Intact</td>
<td>Septal cartilage, fascia (allograft)</td>
<td>Dorsal only graft, columellar strut, tip only graft</td>
<td>7</td>
<td>Very satisfied</td>
<td></td>
</tr>
</tbody>
</table>

F, female; M, male; N/A, not available; B, bilateral; LLC, lower lateral cartilage
Fig. 4B_revised