Assessment of Rhinoplasty Effects on Tear Passage Time through Nasolacrimal Duct by Chloramphenicol Drop Bitter Taste Test

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Abstract

Purpose: Rhinoplasty is one of the most common cosmetic surgeries. Lateral osteotomy is one of the surgical steps used in rhinoplasty. There are several procedures to determine the tear passage time through nasolacrimal duct (NLD) such as dacryocystography, dacryoscintragrapy, taste test, etc. One of the useful tests which can be used for determination of tear passage through NLD is dripping of chloramphenicol drop in the eye and recording the passage time by its bitter taste perception by the patient. It should be pointed out that this test is easy to do, inexpensive, accessible, and safe.

Methods: In this interventional case series study (before and after intervention), 37 patients (74 eyes) were examined. The chloramphenicol taste test was done one week before and one week, one, three and six months after rhinoplasty was performed. All the results were statistically analyzed through paired T-test.

Results: The average time (±SD) of tearing passage was 291.90 (±120.04) seconds before surgery, which have reached in turn to 503.00 (±241.37), 478.62 (±212.86), 398.78 (±157.46), 359.86 (±159.51) seconds on the first week, first, third and sixth months after surgery. In this study, the postoperative average tear passage time was significantly longer than preoperative time (P=0.001).

Conclusion: We did not find any permanent obstruction after rhinoplasty. The results showed that tearing passage time increased after rhinoplasty.

Keywords: Rhinoplasty, Nasolacrimal Duct, Taste Test, Chloramphenicol

Introduction

Rhinoplasty is one of the most common cosmetic surgeries. Lacrimal sac is the most common part of tearing system which is injured in lateral osteotomy during rhinoplasty operation.

Complete obstruction of nasolacrimal (NL) system with tearing and mucopurulant discharge during and after rhinoplasty is extremely rare.\textsuperscript{1} Regarding the anatomical and physiological function and patency of NL system, physical exam alone would be inaccurate and incomplete. More than one lacrimal test may be required for a definitive diagnosis in patients with epiphora due to anatomical or functional NL outflow obstruction.\textsuperscript{2} Traditional dacryocystography and the newer techniques such as dynamic MRI dacryocystography and computed tomography-dacryocystography could be useful as a reliable diagnostic imaging technique in many patients, but they are more expensive and time wasting in addition to the radiation hazards. On the other hand it is necessary to use a repeatable and safe test for the evaluation of NL system with the least side effects. Although Dacryoscintigraphy with Technetium 99 drop test could be done even in children, but it is expensive and may have some limitations for pregnant women.\textsuperscript{3-5} Dacryoscintigraphy provides valuable independent information and allows more accurate management decisions and it makes possible determination of subclinical nasolacrimal duct (NLD) obstructions.\textsuperscript{6,7} NLD irrigation is also an invasive and non-physiologic test for NLD Evaluation.\textsuperscript{8} Single-drop Jones testing is of considerable significance,\textsuperscript{9} but clinically and practically, it is more time wasting.

Chloramphenicol taste test is a rapid, simple, none invasive, inexpensive and physiologic NL aperture test that provide useful information about tearing system before and after rhinoplasty surgery. Aplastic anemia has been reported in systemic chloramphenicol (1 in 25000 - 1 in 40000) which is mostly curable and is extremely rare while using it as eye drops.\textsuperscript{10} Systemic chloramphenicol seems better to be avoided during pregnancy but is not absolutely contraindicated.\textsuperscript{11} NL system begins from medial aspects of the lids by punctoms and joins to the lacrimal sac by canaliculi and passes through NLD in lateral wall of the nasal cavity and terminates below the inferior meatus of the nose, therefore this system is very prone to injury during nasal surgeries.\textsuperscript{12}

Two main goals of rhinoplasty are reshaping and beautification. Rhinoplasty can reduce or increase the size of the nose, change the shape of the nasal tip, narrow the wideness of the nostrils, or change the nasolabial angle. It may also correct a congenital or traumatic deformity, or improve nasal obstruction.\textsuperscript{13} Tearing system may be injured during rhinoplasty. It improves spontaneously in most cases. However, there are still some patients with tear system problems after rhinoplasty. Epiphora is the result of the tear drainage system problems, which may be induced by other diseases such as trauma, dacryolithes, dacryocystitis, radiations, infections, mucine impaction, or idiopathic.\textsuperscript{14,15} Damages on tearing system may caused by trauma to mid face in lateral and medial osteotomy of nasal bone. Lateral osteotomy is the important part of the rhinoplasty which has different techniques such as intranasal and extranasal methods.\textsuperscript{16} The taste test can be done by one drop of the chloramphenicol dripping inside the inferior fornix of the eye and then recording the passage time of the drug by its acrid sensation by the patients.

As this test is accessible, non-invasive, and cost effective in contrast with the other tests such as dacryocystography and dacryoscintigraphy, we decided to use it in this study to identify the effects of rhinoplasty on tear passage time through drainage system. There are some false positive and false negative results for this test. A sweet or bitter fluid (such as saccharin or chloramphenicol drop), if instilled in the conjunctival cul-de-sac, passes through NLD and finally reaches and feels by the taste buds of the tongue.\textsuperscript{17} The rate of rhinoplasty is progressively increased in the human communities. The aim of this study was to explain the importance of the lacrimal drainage system and possible hazards of NL damages during rhinoplasty.
Methods
This interventional case series study has been performed on 37 patients, which intended to do rhinoplasty during years, 2005 and 2006. Written informed consent was obtained from all the patients. Patients were visited and examined only by an ophthalmologist regularly and systematically, regarding the safety of their tear drainage systems, by: asking about history of epiphora, eye inspection, chloramphenicol taste test, scintigraphy, and pressure over lacrimal sac (tear reflux test) and irrigation of NLD by sterile saline solution in each eye separately with a period of half an hour between the two eyes, if there wasn’t any obstruction in tear drainage system they were included in the study. Scintigraphy was made to exclude the cases with physiologic NLD obstruction that may cause false negative results of chloramphenicol test. Also the pregnant patients were excluded due to the possible side effects of the drop. Any functional obstruction or sensation disturbances may cause false positive or negative results therefore, we excluded these cases before surgery. The chloramphenicol taste test has been done in all of the patients one week before rhinoplasty by dripping of three drops of chloramphenicol in inferior fornices of the patients' eyes. Then, the duration between dripping of the drop and sensation of the bitter taste of chloramphenicol were recorded. It has been carefully observed that the drops could not enter the mouth through the cheek. The duration of the chloramphenicol bitter taste sensation has been recorded through Chronometer by a qualified assistant.

Considering the limitation in doing simultaneous bilateral test, the duration of time between the two eyes' exams was at least 60 minutes. All 37 patients who had the above criteria were treated by closed rhinoplasty with lateral osteotomy and intra nasal incision over the inferior turbinate.

We used the 4 mm osteotom with lateral guide. After operation all the patients' nasal cavity was packed by smeared bandage by gentamicin ointment for 48 hours. After 48 hours, the nasal cavity was irrigated with saline 0.9% by the patients every six hours for two days. Then, the patients, tearing drainage system were reevaluated one week one month, three months and six months after rhinoplasty by chloramphenicol taste test and the duration of tear passage time were recorded again by this test. Then the recorded times after rhinoplasty were compared with the recorded times before rhinoplasty.

Results
This study was done on 74 NLD in both eyes of 37 cases of rhinoplasty with the age range of 19 to 37 years (Mean ±SD=25.91±4.13) in which 24 cases (64.9%) were female and 13 (35.1%) were male (Table 1).

Table 1. Patients' demographic properties

<table>
<thead>
<tr>
<th>Sex</th>
<th>No</th>
<th>%</th>
<th>Age</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>24</td>
<td>64.9</td>
<td>19-37</td>
<td>26.07</td>
<td>4.77</td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>35.1</td>
<td>22-31</td>
<td>25.61</td>
<td>2.75</td>
</tr>
<tr>
<td>Total</td>
<td>37</td>
<td>100</td>
<td>19-37</td>
<td>25.91</td>
<td>4.13</td>
</tr>
</tbody>
</table>

Six patients (16.2%) complained from epiphora, one week after operation. The rate of epiphora decreased to 2 patients (5.4%) one month after rhinoplasty and it reached to zero after 3 and 6 months after operation. The average for tear passage time measured by chloramphenicol test was 291.9 seconds one week before rhinoplasty (n=74, min=50 sec, max=600 sec; SD=120.09 sec) and the average of tearing passage time one week, one month, three months and six months after rhinoplasty were 503.00, 478.62, 397.86, 359.86 seconds respectively (min 180 sec and max 1500 sec and SD 241.37 sec). The paired T-Test for comparing of the average tear passage time one week before and one week (P<0.001), one month (P<0.001), three months (P<0.001), six months (P<0.001) after operation showed statistically significant differences as shown in table 2. The tear passage time did not reach to the preoperation levels during six months follow-up.
Table 2. Comparing the tearing passage time before and after rhinoplasty in 74 NLD of 37 patients

<table>
<thead>
<tr>
<th>Tear passage time</th>
<th>Mean</th>
<th>SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before surgery</td>
<td>291.91</td>
<td>120.04</td>
<td></td>
</tr>
<tr>
<td>One week after surgery</td>
<td>503.00</td>
<td>241.37</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>One month after surgery</td>
<td>478.62</td>
<td>212.86</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Three months after</td>
<td>398.78</td>
<td>157.46</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Six months after surgery</td>
<td>359.86</td>
<td>159.51</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Discussion

The results of this study showed that although tear passage time through NLD significantly increased after rhinoplasty, but it improves gradually during six months follow-up.

Uzan L et al, has reported about 29.5% tearing rate one week after rhinoplasty. The age group in this study was between 17-47 years and the average was 26.9 years. He reported that tearing passage time increased one week and three months after operation (P=0.001).\(^\text{18}\) The results of this study also showed that the tearing passage time has increased one week, one month and three months after operation (P=0.001).

Based on the study of Michael Evan Sachs, the epiphora three months after surgery was reported 2%.\(^\text{19}\) In the present study epiphora presented in 16.2% one week after operation and decreased to 5.4% one month after operation.

Lavin and his colleagues reported that there weren’t any damages in the lacrimal system after rhinoplasty by doing dacryocystography in 15 patients.\(^\text{20}\) Also; Uzun L et al, had not found any constant damages on NL system in their patients. They have only reported the patency of NL system but they didn’t measure and record the tear passage time through NL system.\(^\text{18}\) In the current study, we have considered both the opening and tearing passage time through the tearing system.

According to this research, after rhinoplasty with lateral osteotomy technique the tear passage time highly increases in the first week after surgery, which could be due to severe inflammation and mucosal edema in the sinus and pressure over the tearing outlet. We had also found highly increased tearing passage time in the first, third and sixth months after surgery, compared to one week before surgery.

Excessive tearing gradually decreases after rhinoplasty and even completely disappears three months after surgery, but although the tear passage time gradually decreases after operation but it never reaches to the rates before surgery even six months after surgery. This shows that the rhinoplasty although not resulting in permanent obstruction of NL system in majority of cases but can affect the NL system through increasing tear passage time. This was an important finding comparing with other above mentioned studies.

Tear viscosity in the younger population is lower than in the older population, this can help to faster passage of tear through NL system. As usually rhinoplasty is done on younger population in all over the world and also rhinoplasty increases the tear passage time by narrowing effect on NL system, this effect would remain permanently. Gradually increased viscosity of tear may lead to a decreased flow rate of tear through NL system and this problem must be considered as a hazard when obtaining informed consent before surgery. Of course this can be an attractive subject for more investigations in the future. It seems that in lateral osteotomy in addition to direct damage on NL system, other anatomical changes such as medial canthal displacement, medial displacement of punctoms, periductal inflammation and fibrosis must be considered.\(^\text{18}\)

Conclusion

In conclusion, chloramphenicol taste test could be considered as a useful study before rhinoplasty surgeries.
References