Open Carpal Tunnel Release with use of a Nasal Turbine Speculum

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HYPOTHESIS
Incomplete release of the transverse carpal ligament (TCL) and median nerve injury are complications of carpal tunnel surgery (CTS). We describe a modified mini-open release using a fine nasal turbinate speculum to aid the proximal release with direct visualization of the proximal limb of the TCL and distal volar forearm fascia (DVFF). This technique ensures a safe and complete proximal release with optimal visualization and minimizes complications.

BACKGROUND
• Carpal tunnel release (CTR) is the most common hand and wrist surgery in the United States, with approximately 400,000 operations annually.
• There are several methods to decompress the carpal tunnel including: standard open carpal tunnel release (OCTR), mini-open approaches, and various endoscopic techniques.
• Standard OCTR has been found to be technically less demanding and associated with decreased complications and costs.

METHODS
Design:
• Retrospective cohort analysis of 101 consecutive modified mini-open CT Rs (63R; 38L) performed in 88 patients (51F; 37M) over a 1-year period.
• Single center academic hand surgery practice with fellowship trained hand surgeons.
• CT Rs performed in the setting of trauma and revision cases were excluded.
• Preoperatively, patients were graded as mild, moderate, or severe based on clinical and/or electro-diagnostic criteria.

Technique:
• 2.5cm palmar longitudinal skin incision and standard distal release of the TCL to the sentinel fat pad is completed.
• Proximally, the subcutaneous tissues above the proximal limb of the TCL and DVFF are mobilized to 2cm proximal to the distal wrist flexion crease.
• A fine nasal turbinate speculum is inserted into the plane above the proximal limb of the TCL and DVFF.
• Direct topside visualization of the DVFF and its confluence with the TCL is achieved.
• The ulnar neurovascular bundle is protected by the ulnar blade of the speculum.
• A long handle scalpel is used to incise the DVFF and TCL under direct visualization from proximal to distal in continuity with the previously completed distal release.

RESULTS
• Over a 10-month interval, 101 consecutive (63R hands, 38L hands) mini-open carpal tunnel releases were performed using this modification for the proximal release.
• Mean follow up period of approximately 3 months (11.3 weeks).
• Carpal tunnel symptoms were relieved in all patients with a high degree of satisfaction
• None of the patients had to return to the OR due to incomplete release.
• There were no major complications such as infection, neural or vascular damage or severe residual pain.
• Four patients reported minor residual numbness in their fingers at latest follow up visit, but still with major improvement from their baseline before surgery.

CONCLUSION
• Given that the most frequent complication of carpal tunnel surgery is incomplete release of the transverse carpal ligament, this technique which uses a nasal turbinate speculum to better visualize the median nerve could reduce the reoperation rate.
• The nasal turbinate speculum allows the surgeon to see the confluence of the dorsal volar forearm fascia and TCL.
• Additionally, since the complete release can be visualized, there is minimal chance of injury.
• The 2007 Cochrane review has found that there is no strong evidence supporting the need for replacement of OCTR with endoscopic techniques.
• ECTR is more costly and resource-intensive than open carpal tunnel release and is associated with higher rates of certain complications.
• A recent review in 2006 of over 80 studies reported an overall complication rate (reversible and major neuro-vascular structural injuries) of 0.74% for the OCTR technique and 1.63% for the ECTR (p=0.005).
• The novel technique using a nasal turbinate speculum presented in this study is easily reproducible and allows first time surgeons to visualize all the important structures.
• Given that this technique does not require an endoscope or an endoscope-viewing tower, it is likely more cost effective and requires less time for turn over between cases.
• Patients obtain good relief of their carpal tunnel symptoms using this technique and most return to their daily activities within weeks after operation.

Table 1. Basic characteristics of 101 cases of open carpal tunnel release with use of a nasal turbiné speculum over one year.

<table>
<thead>
<tr>
<th>N</th>
<th>101 hands (63 Right, 38 Left)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>88 (51 Female, 37 Male)</td>
</tr>
<tr>
<td>Mean Age</td>
<td>62.8 years</td>
</tr>
<tr>
<td>Mean Tourniquet Time</td>
<td>16 mins</td>
</tr>
<tr>
<td>Mean # Days of Follow Up</td>
<td>78.8</td>
</tr>
<tr>
<td>% Symptom Improvement</td>
<td>100%</td>
</tr>
<tr>
<td>% Significant Complications</td>
<td>0%</td>
</tr>
<tr>
<td>% Minor Complications (improved but residual numbness)</td>
<td>4.0% (4/101)</td>
</tr>
</tbody>
</table>

*Mean Tourniquet time is based on isolated cases of CTR only.*