



The Efficiency of Treatments for Thoracic Outlet Syndrome

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Abstract

The thoracic outlet syndrome (TOS) is a collection of different symptoms and disorders that result in the neurovascular structures compression in the upper extremity area of the brachial plexus, subclavian artery and vein, which results in pain, numbness, and tingling. The diagnosis for TOS is often complex as it may include a physical examination and complementary/clinical tests such as: radiography, MRI, Angiography by digital subtraction, Adson's maneuver, Tinel's maneuver, etc. in the viewing of the involved structure. Indications for surgical treatment are debated and often reserved for cases which involve the failure of conservative management. Various surgical approaches have been proposed for the treatment of thoracic outlet syndrome (TOS), however, there is no "gold" procedure for its complicated and multidisciplinary problem.

The objective of this review is to analyze already collected surgical data to detect which surgical approach is more efficient. Specifically, understanding the key differences between the supraclavicular approach and the transaxillary approach was investigated. This literature review examines studies conducted on surgical techniques based on the thoracic outlet syndrome. This literature review reviewed the differences in outcome after supraclavicular neuroplastic of brachial plexus (SNBP [no rib resection]) and transaxillary first rib resection (TFRR) in patients in whom the dominant clinical problem was pain and other relevant publications. A total of fifty-five patients were randomized to undergo TFRR or SNBP. Review of the literature found that transaxillary first rib resection provided better relief of symptoms than SNBP. Patients reported significantly less pain, greater percentage of pain relief, and less pain on an effective scale. However, there were also literature reviews that said that they were very similar in effectiveness.

Systematic Literature Review

Publications were found through databases: PubMed and Google Scholars

- One randomized controlled clinical study: the differences in outcome after supraclavicular neuroplastic of brachial plexus (SNBP [no rib resection]) and transaxillary first rib resection (TFRR)
 - A total of fifty-five patients were randomized to undergo TFRR or SNBP
 - There were 24 TFRRs (in two cases the procedure was bilateral) and 25 SNBPs.
- One retrospective review was conducted on patients who underwent thoracic outlet decompression between 2010 and 2015.
 - Analyzed data on demographics, comorbidities, presenting symptoms, and type of TOS.
- Relevant Publications
 - The Basics of Thoracic Outlet Syndrome
 - Thoracic Outlet Syndrome: Which Surgical Approach?
 - Outcomes of Transaxillary Approach to Cervical and First-Rib Resection for Neurogenic Thoracic Outlet Syndrome

Background

The thoracic outlet syndrome (TOS) results from compression of neurovascular structures supplying the upper extremity as they exit the thoracic outlet.

The transaxillary approach (TA): makes an incision in your chest to access the first rib; easy access to the first rib without disturbing the nerves or blood vessels

The supraclavicular approach (SA): makes an incision just under your neck to expose your brachial plexus region; repairs compressed blood vessels

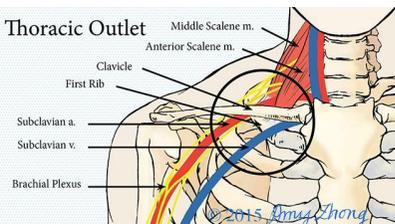


Figure 6: Thoracic outlet and relevant anatomy

Data Analysis & Results

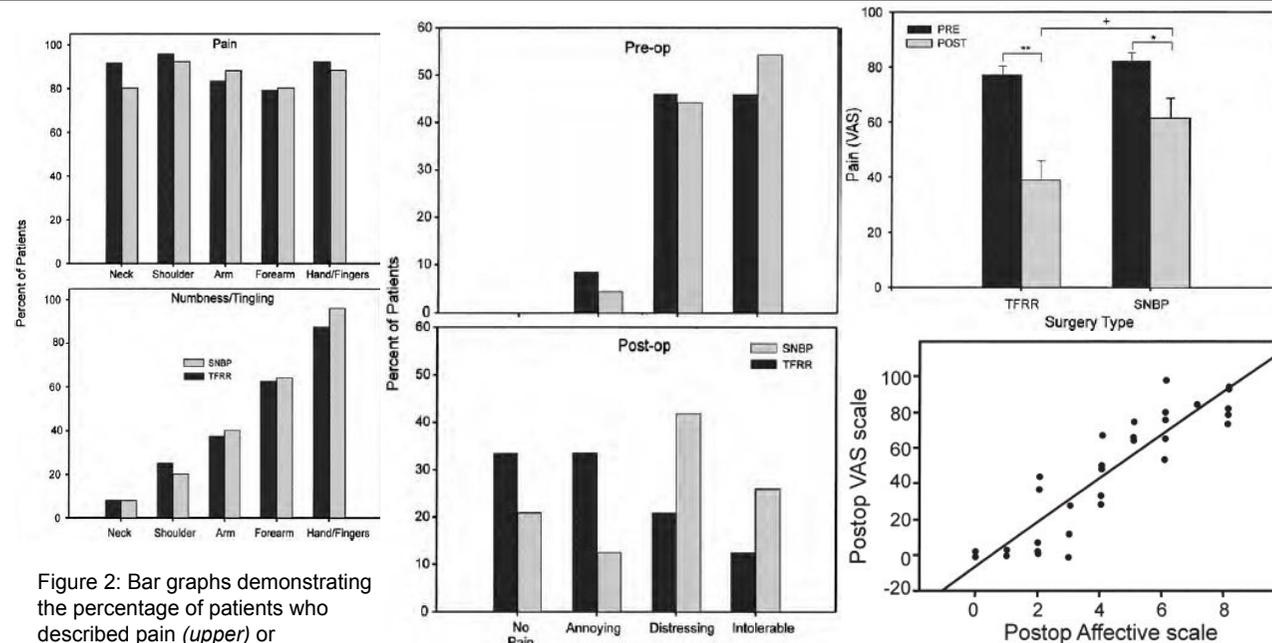


Figure 2: Bar graphs demonstrating the percentage of patients who described pain (upper) or numbness/tingling (lower) in different areas of the body preoperatively. The intergroup distribution of symptoms was similar.

Figure 3: Bar graphs depicting pre- and postoperative pain determined using a category scale (SNBP, p = 0.005; TFRR, p = 0.0001). Upper: Preoperatively, almost all patients complained of their pain as distressing to intolerable. Lower: Postoperatively, however, the number of cases in which patients complained of distressing and intolerable symptoms was 33% in the TFRR group and 68% in the SNBP group.

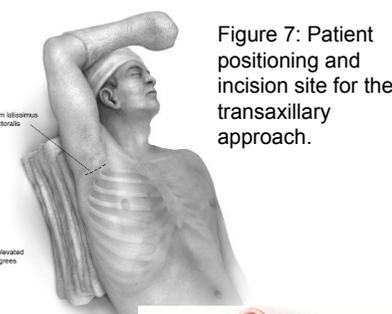


Figure 7: Patient positioning and incision site for the transaxillary approach.

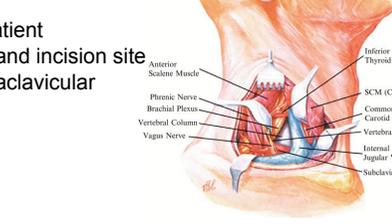


Figure 8: Patient positioning and incision site for the supraclavicular approach.

TABLE 1. DEMOGRAPHICS, COMORBIDITIES, AND PERIOPERATIVE CHARACTERISTICS OF THE STUDY POPULATION

Demographics and comorbidities	TA n=40	SC n=42	P
Gender			.074
Male	22	14	
Female	18	28	
Age, years (mean ± SD)	29.2 ± 12.1	32.2 ± 12.3	.219
Median	27	32	
Range	14-70	13-57	
Type			.783
Neurogenic TOS	18	16	
Venous TOS	17	21	
Arterial TOS	4	4	
Adjunct procedures	0	11	<.001
LOS, days (mean ± SD)	2.3 ± 1.9	2.4 ± 1.4	.230
Median	2	2	
Range	1-10	1-7	
OR time, minutes (mean ± SD)	151.3 ± 54.1	126.1 ± 36.1	.112
Median	148	124.5	
Range	79-300	64-195	
Resolution of symptoms			.790
None	2	2	
Partial	17	21	
Complete	21	19	
Complications			.816
None	35	37	
Minor	2	3	
Major	3	2	

LOS, length of stay; OR, operative room; SC, supraclavicular; SD, standard deviation; TA, transaxillary; TOS, thoracic outlet syndrome.

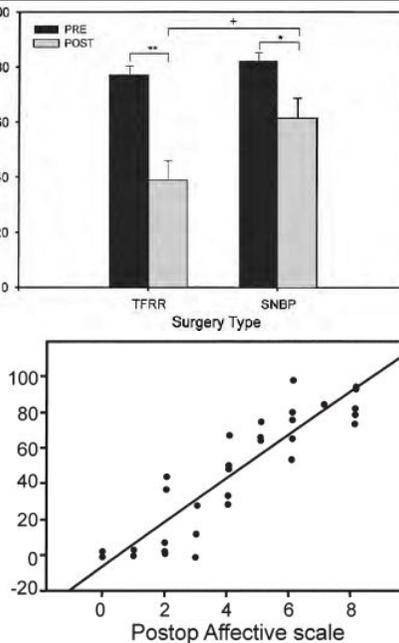


Figure 4: Bar graph showing pre- and postoperative VAS pain scores (*p = 0.01 [SNBP group]; **p , 0.00001 [TFRR group]) The score decreased significantly for both groups (1p = 0.03).

Figure 5: Comparison of postoperative pain ratings based on the VAS compared with the affective scale for each patient (R2 = 0.83) (affective scale: 0, no pain; 1, not bothersome; 2, slightly annoying; 3, annoying; 4, very annoying; 5, distressing; 6, very distressing; 7, intolerable; and 8, very intolerable).

Conclusion

There are both slight and significant differences between the supraclavicular approach and the transaxillary approach before and after surgery of the thoracic outlet syndrome. For example, in terms of pain, analysis of these findings demonstrated that TFRR was associated with greater benefits than SNBP. Additionally, the patients who underwent TFRR were significantly more likely to report good or excellent pain relief (75% compared with 48%, respectively; p = 0.02). However, we can also see that minor complications were seen in 6% (n = 5) of patients with no significant difference in both groups.

Future experiments analyzing this data could be used to enhance and perfect both these surgical techniques to help create a more effective surgical approach solution to thoracic outlet syndrome. Additionally, researchers could work on looking at other surgical approaches and comparing those as well to come to a clear conclusion.

Limitations



This literature review does not look at other surgical techniques other than the transaxillary and supraclavicular in which the conclusion may prove to be wrong when compared with other surgical technique.



In many patients' surgery failed to yield a benefit and, in the majority, only partial symptomatic relief was achieved.



Limitations mainly pertaining to its retrospective design and relatively small number of patients.



The analysis of symptom resolution postoperatively was based on patients' subjective input rather than a standardized questionnaire.

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FIG. 1. (A, B) Resolution of symptoms based on approach.