

Peer Review File

Article information: <https://dx.doi.org/10.21037/jovs-23-17>

Reviewer A

This is a very important subject that has technical merits, however, needs major internal rearrangements.

The "BACKGROUND", in my opinion, should be compressed into fewer words and the "METHODS" should be expanded in a significant manner.

Reply: We shortened the "background" section and revised the "methods" part (p 2 line 45-53)

The authors have to differentiate the TOS without cervical rib and with cervical rib. This is 9%, 6 patients out of 67, subset cervical rib group.

Reply: The patients did not differ from usual TOS caused by the first rib. We precised that (p 3 line 115)

They have to describe in more detail the "completely portal approach" and the distribution of the ports and the space from which they are working.

Reply: We changed the wording "completely portal approach" to "3-port robotic approach" so the latter will be more precise (p 2 line 51). The intercostal spaces are described p 4 line 142-145.

Is this a trans-axillary or trans-thoracic approach?

Reply: It is trans-thoracic. The word has been added (p 4 line 140)

It is important to differentiate again the approach towards first rib resection and the first rib resection and cervical rib combined.

Reply: We added more precise wording to the description of the operative technique (p 4 line 149, 154, 157-158)

In the results, it is important that they elaborate on the arterial vascular replacement in 2 cases. I would like to suggest to classify the cervical ribs as traditional Type I or Type II based on morphology, length and insertions. Basically all neurovascular compressions at the thoracic outlet area are related to cervical bands by the Roo's classification from 1976, in which 10-12% are related to cervical ribs Type I and Type II.

Reply: We clarified cervical rib morphology, length and insertion (p 3 line 123-125, p 4 line 138-139 and line 158)

What is "sulcus superior region?" Is this the supraclavicular region?

Reply: To avoid confusion we changed the term to "thoracic outlet", to be consistent with the topic.

Finally, the author comes to very important conclusions about the safety and efficacy of this approach. I would suggest rephrasing the conclusions.

Reply: We added the conclusions with this aspect (p 7 line 295-296)

Again, this is a very important technical contribution and I would support the approval of this abstract.

Reviewer B

The authors present novel research describing cervical rib removal via a robotic approach. This provides a great addition to the literature on robotic approach to first and cervical rib resection.

Great images!

Do you have any data on the classification of the cervical ribs for the patient population?

Reply: All the cervical ribs presented as type 3 or 4 according to Gruber classification.

What standardized metrics does your group use to diagnose TOS?

Reply: We use at least contrast enhanced magnetic resonance imaging or computed tomography scans in an elevated arms position. Moreover duplex-sonography, angiography or neurophysiological evaluation with senso-motoric neurography and needle myography are conducted where appropriate.

We described the work up already in our paper in 2018. <https://doi.org/10.1007/s00268-018-4636-4>

How was the diagnosis of cervical rib made?

Reply: All patients received magnetic resonance imaging or computed tomography scans.

The statement on page 7, lines 270-271, “Though, robotic surgery seems to becoming the new gold standard of treatment for all kinds of thoracic outlet syndrome and its underlying bony abnormalities like supernumerary ribs” is an overstatement. I would argue that robotic surgery is a great option for TOS decompression but it is hardly a gold standard as the majority of TOS decompression operations are still performed via open transaxillary vs supraclavicular approaches.

Reply: Indeed, robotic surgery is not available in a wide range of hospitals. But the use is spreading all over in recent years in thoracic surgery since segmentectomies become more and more popular. So we change the wording (p 7 line 298-299)

Reviewer C

The authors present a brief report on the application of robotic-assisted techniques to resection of cervical ribs in 6 patients with thoracic outlet syndrome (TOS).

1. In the abstract the authors state: “Traditional surgical techniques using different approaches to remove the first and a supernumerary rib do not usually allow good exposure of the whole field of resection and the neurovascular bundle. We have therefore developed the previously described

robotic approach to overcome these limitations.” This is incorrect in that traditional surgical exposure through the supraclavicular approach provides superb exposure of the entire brachial plexus, subclavian artery, and subclavian vein, to an extent NOT provided by robotic approaches. The authors conclusion that robotic techniques provide “unsurpassed exposure” is untrue and statements to this effect should be modified throughout the manuscript.

Reply: Since our experience differs from your comment on these techniques, we truly think the described robotic technique allows better visualization and handling of the adjacent tissue due to the technical possibilities of the robot.

To avoid prejudice, we removed this passage from the abstract and wording from the manuscript. (p 2 line 45-46, line 66)

2. It is concluded that robotic techniques are safe and effective for thoracic outlet decompression. However, because this approach is still in early development and application, these outcomes are only still being evaluated and the authors should be more cautious in their conclusions. Effectiveness has only been evaluated in the short-term, with no long-term outcomes being reported and the rate of recurrence being unknown.

Reply: You are right, recurrence rate has not been evaluated in most of the papers. Either this signifies a low recurrence rate or patients are not followed for a longer period. We usually follow-up for 2 to 3 years (including duplex sonography) and then advise the patients to immediately present in our outpatient clinic for new symptoms in the future. So far none has been referred yet in more than 6 years. Together with other work from Burt et al safety is well assessed in terms of postoperative course and morbidity. We removed “effective” (on p 2 line 65).

The robotic technique is first described by Gharagozloo in 2012 and has been adapted in multiple papers through these more than 10 years by different authors. Therefore, we assume that it must not be indicated as “new”.

3. The authors note that in 2 of the 6 patients they performed repair of the subclavian artery. There is no description of these arterial repairs and it is suspected that this was conducted by standard open vascular surgical techniques. In that event, it is not clear what advantage a robotic approach would have offered, since the cervical/first rib resection could have been conducted by the same approach used for arterial repair.

Reply: Indeed the repair of the subclavian artery was conducted by an open approach. As an advantage, the incision could be held in a minimalistic fashion, through which an additional resection of the ribs couldn't have been performed. (p 4 line 167-169).

4. In their treatment of neurogenic TOS, the authors do not discuss how they addressed the other components of surgical decompression (beyond rib resection) that are commonly achieved by supraclavicular operations, particularly resection of the anterior and middle scalene muscles and brachial plexus neurolysis. One has the impression that robotic techniques do not permit these elements of thoracic outlet decompression to be performed, thereby providing an anatomically-incomplete approach to neurogenic TOS.

Reply: Since this was one of our first cases, indeed we used a small incision for supraclavicular neurolysis, but no rib resection could be performed through that. Concerning resection of the scalene and subclavius muscles and even bands and ligaments, these structures can be assessed well from

the robotic approach. (p 4 line 169-170 and line 162-163)

5. In the patients with neurogenic TOS, did the authors obtain functional measures of outcome that are typically used in assessing outcomes in this field, such as the Disability of the Arm, Shoulder, and Hand (DASH) scores?

Reply: Unfortunately, we did not assess the patients with a specific score. But they were all clinically assessed for correspondent symptoms.

6. Robotic cervical and first rib resection appears conceptually and practically similar to transaxillary first rib resection, a procedure known to have recurrence rates of 5-30% in long-term follow-up. As there is no expectation for recurrence rates to be any less after robotic surgery, how do the authors approach surgical treatment for recurrent neurogenic TOS?

Reply: Beside one case of a non-compliant patient, unable to stay on oral anticoagulants, we did not meet a recurrent disease in the 2-year follow-up period. We presume to choose a likewise transthoracic approach.