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Platysma sparing approach to anterior cervical spine surgery: A less exposure surgery technique

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ABSTRACT

Introduction: Authors aim to demonstrate the surgical technique and outcomes of using a platysma sparing approach to anterior cervical spine surgery.
Methods: Medical records of 496 prospective patients, group 1 (259 patients) with an outpatient platysma muscle-sparing approach. Group 2 (237 patients) with inpatient standard muscle-splitting approach.
Results: Intergroup comparison showed statistical significant improvement in VAS neck and NDI scores $p = 0.009$ and $p = 0.012$ and surgical operative time and estimated blood loss, $p = 0.003$ and $p = 0.006$ respectively.
Conclusion: This anatomy sparing technique demonstrates a safe, effective and reproducible approach to cervical spine surgery which is a goal of less exposure surgery philosophy.

1. Introduction

The development of innovative equipment and novel surgical approaches has made the transition from open to minimally invasive and less exposure surgery for the spine safer and simpler.[1–3] The technique for anterior cervical surgery defined by Cloward[4] and Smith and Robinson[5] has been modified over the years by numerous surgeons since 1958.[6–12] These techniques and approach to the anterior cervical spine, although relatively straightforward by most standards, sets the stage for the rest of the operative procedure. It also impacts the patient's first impression and level of satisfaction in the early postoperative period with regards to cosmesis, discomfort and pain.

Healthcare is rapidly changing based on patients' needs, insurers and surgeon factors in services provided.[13–15] Therefore surgical techniques need to be adapted to continue to be innovative and requires a full comprehension of previous techniques, complications and future challenges. Incision to the anterior cervical spine is based on approach to the recurrent laryngeal nerve.[16–19] However the standard surgical dissection for the anterior cervical spine involves splitting the platysma.[5]

The authors hypothesized that the traditional muscle-splitting approach through the platysma muscle during surgical access to the anterior cervical spine can potentially increase surgical time with time spent ensuring hemostasis on entry and suturing the muscle on closure, can potentially increase blood loss and also contribute to worsened cosmesis.[20] A simple and less exposure surgery approach is described and compared, which allows the platysma to glide easily over the sternocleidomastoid muscle and enabling a less invasive technique.

2. Method

We examined the medical records of 496 prospective patients who underwent single and two-level anterior cervical spine surgery. Two groups were assigned: Group 1 (259 patients) included patients who had a platysma muscle-sparing approach in outpatient setting. Group 2 (237 patients) had a standard muscle-splitting approach in the inpatient setting. Muscle-sparing involved using the groove between the platysma and sternocleidomastoid muscles and the loose connective tissue layer (the superficial cervical fascia[21]) as a landmark.

Indications for TDR surgery included symptomatic, spontaneous/degenerative or traumatic herniated cervical nuclei pulposus with or without radiculopathy and cervical degenerative disc degeneration (DDD) without posterior column instability. Indications for ACDF surgery included cervical spondylosis, stenosing herniated discs,

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Platysma sparing Questionnaire

1. What is your level of pain felt when opening mouth (Try to make chin touch chest)
   1 2 3 4 5 6 7 8 9 10
2. What is your level of pain felt when clenching teeth
   1 2 3 4 5 6 7 8 9 10
3. Choose if satisfied with cosmesis of scar
   ☐ Yes ☐ No

Fig. 1. Questionnaire evaluating platysma sparing approach.

degenerative disc disease with instability and facet arthritis, tropism or facetogenic pain. Patients were only considered for surgery after failed conservative management for at least six weeks.

Patient-reported visual analog scores (VAS) for pain both preoperatively, and at the six-month postoperative follow-up appointment were evaluated. Additionally, a questionnaire was developed to evaluate platysma sparing (Fig. 1).

2.1. Statistical analysis

Statistical analysis was performed using SPSS v22 (IBM corporation, New York, USA). An independent sample student T-test was used to compare groups for continuous data and chi-squared used for categorical data. Continuous data comparisons were expressed as means with standard error. Tests were considered significant if $p < 0.05$.

2.2. Surgical technique

Patients were placed under general anesthesia, appropriately positioned, cleaned and draped in the standard sterile surgical fashion. A transverse midline skin incision was made along Langer's lines in skin crease closest to operative level. Subcutaneous dissection was performed above the platysma with the aid of dissecting scissors and skin retractors to expose the platysma muscle (Video 1). The muscle-sparing technique used for access deep to the platysma muscle in Group 1 involved finger retraction from lateral to medial with placement of a Richardson appendiceal retractor to hold the soft tissue out of the operative field (Video 1). The deep cervical fascia identified (Fig. 2) and further dissection performed to expose cervical vertebrae. Operative procedure performed, hemostasis achieved and a Penrose drain placed. Releasing the retraction was all that was required with preservation of platysma demonstrated prior to skin closure (Video 2).

Patients in Group 2 technique transverse skin incision, incise fascia over platysma, split platysma and identify anterior border of sternocleidomastoid (SCM). After which fascia of SCM incised and SCM retracted lateral with strap muscles retracted medially. Standard operative techniques and hemostatic measures were then completed with closure of the platysma incision and subcutaneous layers with sutures in Group 2.

Supplementary video related to this article can be found at https://doi.org/10.1016/j.jor.2019.06.003.

3. Results

Overall mean age of 51.57 ± 0.8 years, 259 patients in Group 1 (platysma-sparing) 49% were female with the group's mean age being 50.8 ± 0.89 years and BMI 27.77 ± 0.47 kg/m^2. Of the 237 patients in Group 2 (platysma splitting) 53% were female with the group's mean age being 51.5 ± 1.2 years and BMI 23.3 ± 1.5 kg/m^2. No statistical differences in gender, age and BMI were found between groups, p = 0.473, 0.219 and 0.165 respectively. In group 1, 159 (62%) single level and 100 (38%) two levels procedures performed. In group 2, 146 single level and 91 two levels procedures were performed demographics are summarized in Table 1. There was no significance between preoperative VAS neck, arm and NDI scores between Groups 1 and 2, p = 0.129, p = 0.484, and p = 0.401 respectively. Analysis of follow up at six months demonstrated; group 1 mean preoperative VAS neck scores improved from 7.6 ± 0.2 to 3.9 ± 0.1, $p < 0.001$. Preoperative VAS arm score improved from 4.5 ± 0.2 to 2.7 ± 0.2, $p < 0.001$. Preoperative mean NDI score decreased from 51.0 ± 1.6

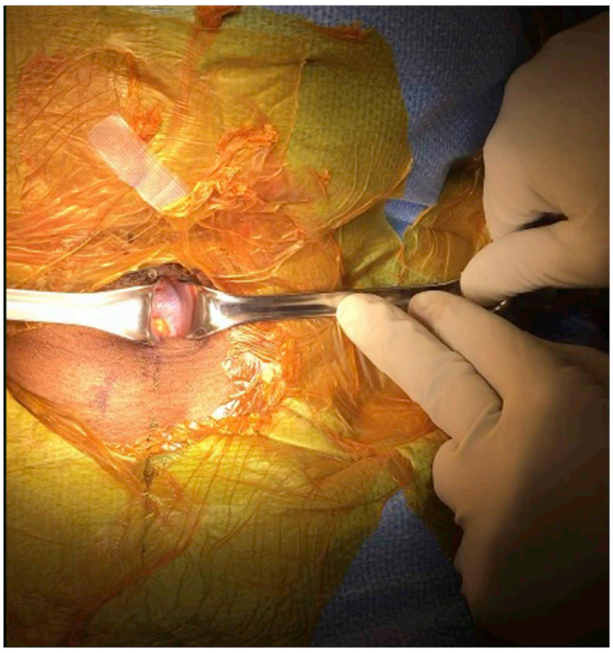

Figure 2. Photograph of deep cervical fascia.

Table 1
Demographic characteristics and intergroup p-value.

Variable	Platysma Sparing (Group 1)	Platysma Splitting (Group 2)	p-value
Age (years)	50.8 ± 0.89	51.5 ± 1.2	0.219
BMI (kg/m^2)	27.77 ± 0.47	23.3 ± 1.5	0.165
Female	127	126	0.473
Male	132	111	
Procedure level			
Single	159	146	0.96
Two	100	91	

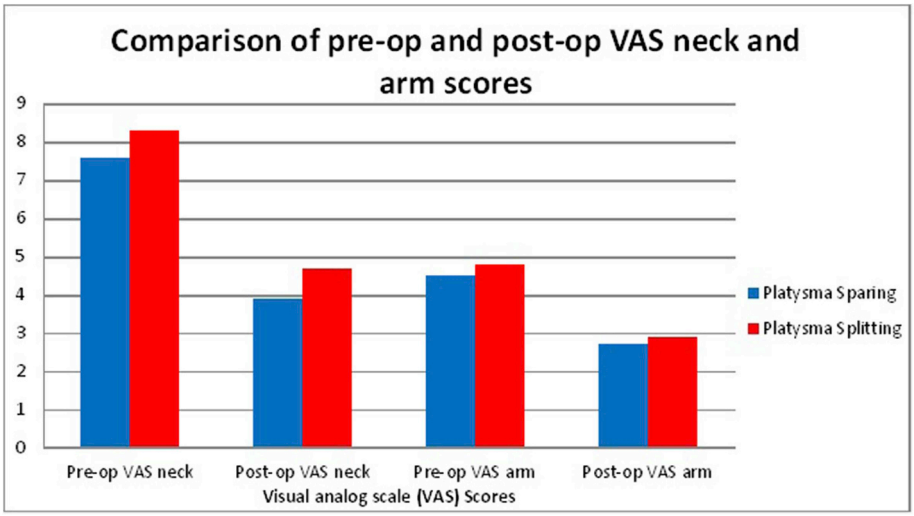

Figure 3. Bar graph depicting VAS neck and arm scores.

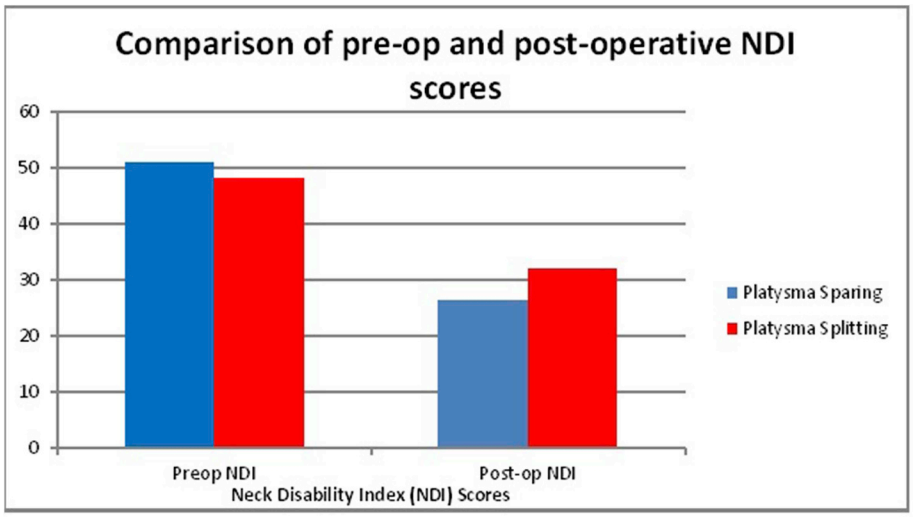

Fig. 4. Bar graph depicting NDI scores.

Table 2
Results of answers to survey (Fig. 1) about pain and cosmesis at 48 h follow up.

Questions 48 h post op	Platysma Sparing	Platysma Splitting	p-value
Pain with chin to chest	5.4 ± 2.3	6.3 ± 2.6	0.001
Pain with clenching teeth	5.3 ± 2.3	6.9 ± 2.4	0.001
Satisfied with cosmesis	198	167	0.154
Dissatisfied with cosmesis	61	70	

Table 3
Results of answers to survey (Fig. 1) about pain and cosmesis at 3 months follow up.

Questions 3-month post op	Platysma Sparing	Platysma Splitting	p-value
Pain with opening mouth	2.0 ± 0.9	2.6 ± 1.3	0.001
Pain with clenching teeth	2.3 ± 1.2	3.0 ± 1.4	0.001
Satisfied with cosmesis	233	206	0.325
Dissatisfied with cosmesis	26	31	

to 26.3 ± 0.8 at six month follow up, $p < 0.001$. Group 2 mean preoperative VAS neck scores improved from 8.3 ± 1.0 to 4.7 ± 0.3 at six month follow-up, $p = 0.001$. Preoperative VAS arm scores improved from 4.8 ± 0.5 to 2.9 ± 0.2, $p < 0.001$. Preoperative mean NDI reduced from 48.1 ± 2.1 to 32 ± 1.2 at six month follow up, $p = 0.001$. There is an overall improvement in VAS neck, arm and NDI scores shown in Figs. 3 and 4 respectively. Intergroup comparison of postoperative outcomes demonstrated statistical significant difference in VAS neck and NDI scores $p = 0.009$ and $p = 0.012$ respectively. No difference was demonstrated in VAS arm scores, $p = 0.173$. The surgical operative time in group 1 was 91 ± 6 min as compared to group 2 which was 139 ± 3 min, $p = 0.003$. Estimated blood loss of 55 ± 3 ml in group 1 compared to 81 ± 9 ml in group, $p = 0.006$.

The main postoperative complaint of postoperative dysphagia was defined as any discomfort or difficulty with swallowing which was not historically present prior to surgery. The severity was assessed using the Bazaz-Yoo dysphagia severity scale of mild, moderate and severe, over the initial 3 month postoperative period.[22] A total of 9 patients complained of dysphagia, 3 patients in group 1 and 6 patients in group 2, $p = 0.3216$. There were no post op wound infections reported in either group.

4. Discussion

Surgical treatment of the anterior cervical spine is indicated for a range of clinical pathologies most commonly trauma, deformities and age-related degeneration. In particular, ACDF, popularized in the

1950s, has established itself as one of the safest and most frequently performed spine surgeries today.[23,24]

The surgical approach is primarily dependent on surgeon-discretion. Proponents for a left-sided approach have shown a reduction in risk of injuring the more variable right recurrent laryngeal nerve, further reduced when combined with intermittent endotracheal cuff deflation.[25]

There is no evidence-based consensus found in the literature, which guides the surgeon's decision to incise the platysma muscle during the first phase of surgical access. Retraction of the platysma has not been shown by our results to increase the risk of postoperative dysphagia. In a surgical subspecialty that is rapidly transitioning toward minimally and less invasive techniques and approaches to the spinal column, these results are in favor of the less invasive philosophy of anatomy preservation and reduction of patient morbidity. A study by Agrawal et al.[20] demonstrated improved cosmesis with less puckering of the skin by splitting the platysma compared to cutting.

Our study findings demonstrate improved outcomes for VAS neck and NDI scores. There was also statistically significant less pain as it relates to use of platysma muscle based on survey at 48 h and three months post op (Table 2 and Table 3).

A few limitations of this study were identified; objective measurements of surgical time gained with the muscle-sparing technique and the blood loss prevented. Surgical time recorded was for overall procedure and not at each stage of procedure: (1) The theoretical time gained by avoiding incision and closure of the muscle was not measured as this is a retrospective review (2) however, the authors believe this may have impacted overall surgery time but unable to justify clinical significance. With regards to blood loss, only overall blood loss was recorded and not during the specific stage of the operation presented. Furthermore, both TDRs and ACDFs were included in both groups, which would impact surgical time as well as blood loss independently with the more extensive and technically demanding ACDF having higher expected values for each parameter.

The authors no longer practice splitting the platysma during an anterior approach to the cervical spine and have shown that patients have satisfactory clinical outcomes.

5. Conclusion

The technique description provided has been shown improved clinical outcomes by a statistically significant margin as well as improved pain at 48 h an three months postoperatively; while not impacting the incidence of dysphagia when compared with the standard muscle-splitting approach. We acknowledge that the traditional muscle-splitting method employed by many surgeons does not harbor any catastrophic clinical consequences. However, the decrease in blood loss and operative time, does give merit to a muscle-sparing approach, at least in an outpatient setting; where less is always more for the surgeon, institution and most importantly, the patient.

Conflicts of interest and sources of funding

We did not seek or receive any funding from the National Institutes of Health, Wellcome Trust, Howard Hughes Medical Institute, or others for this work. KRC is a shareholder in and receives other benefits from SpineFrontier Inc.; none of the other authors (FJRP, AB, JAS) have any potential conflicts of interest to declare for this work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jor.2019.06.003.

References

1. Yang B, Xie J, Yin B, Wang L, Fang S, Wan S. Treatment of cervical disc herniation through percutaneous minimally invasive techniques. *Eur Spine J : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society.* 2014;23:382–388.
2. Celestre PC, Pazmino PR, Mikhael MM, et al. Minimally invasive approaches to the cervical spine. *Orthop Clin N Am.* 2012;43:137–147.
3. Lee SH, Lee JH, Choi WC, Jung B, Mehta R. Anterior minimally invasive approaches for the cervical spine. *Orthop Clin N Am.* 2007;38:327–337 (abstract v).
4. Ralph B. Cloward. The anterior approach for removal of ruptured cervical disks. *J Neurosurg.* 1958;15:602–617.
5. Robinson RA, Smith GW. Anterolateral cervical disc removal and interbody fusion for cervical disc syndrome. *Bull Johns Hopkins Hosp.* 1955;96:223–224.
6. Aronson N, Bagan M, Filtzer DL. Results of using the Smith-Robinson approach for herniated and extruded cervical discs. Technical note. *J Neurosurg.* 1970;32:721–722.
7. Aronson Neal, Filtzer David L, Bagan Merwyn. Anterior cervical fusion by the smith-robinson approach. *J Neurosurg.* 1968;29:397–404.
8. Hirsch C, Wickbom I, Lidstroem A, Rosengren K. CERVICAL-DISC RESECTION. A FOLLOW-UP OF MYELOGRAPHIC AND SURGICAL PROCEDURE. *J Bone Joint Surg Am Vol.* 1964;46:1811–1821.
9. Moyes PD. Anterior interbody fusion. *BC Med J.* 1969;11 SRC:277 GoogleScholar.
10. Pineda A. Avoidance of certain pitfalb during cervical interbody fusion. *Am Surg.* 1968;34:161.
11. Raynor RB. Severe injuries of the cervical spine treated by early anterior interbody fusion and ambulation. *J Neurosurg.* 1968;28:311–316.
12. Williams JL, Allen MB, Harkess JW. Late results of cervical discectomy and interbody fusion: some factors influencing the results. *J Bone Joint Surg Am Vol.* 1968;50:277–286.
13. Hacquebord J, Cizik AM, Malempati SH, et al. Medicaid status is associated with higher complication rates after spine surgery. *Spine.* 2013;38:1393–1400.
14. Alosh H, Li D, Riley 3rd LH, Skolasky RL. Health care burden of anterior cervical spine surgery: national trends in hospital charges and length of stay, 2000-2009. *J Spinal Disord Tech.* 2015;28:5–11.
15. Boss EF, Mehta N, Nagarajan N, et al. Shared decision making and choice for elective surgical care: a systematic review. *Otolaryngology–head and neck surgery. official journal of American Academy of Otolaryngology-Head and Neck Surgery.* 2016;154:405–420.
16. Ebraheim NA, Lu J, Skie M, Heck BE, Yeasting RA. Vulnerability of the recurrent laryngeal nerve in the anterior approach to the lower cervical spine. *Spine.* 1997;22:2664–2667.
17. Kilburg C, Sullivan HG, Mathiason MA. Effect of approach side during anterior cervical discectomy and fusion on the incidence of recurrent laryngeal nerve injury. *J Neurosurg Spine.* 2006;4:273–277.
18. Beutler WJ, Sweeney CA, Connolly PJ. Recurrent laryngeal nerve injury with anterior cervical spine surgery risk with laterality of surgical approach. *Spine.* 2001;26:1337–1342.
19. Liguoro D, Vital JM, Guerin J, Senegas J. Anatomical basis of the anterior cervical spine approach: topographic study of the nerve structure. *Surg Radiol Anat.* 1992;14:203–208.
20. Agrawal A, Rao GM. Transverse cervical skin incision and vertical platysma splitting approach for anterior cervical vertebral column exposure. *Romanian Neurosurgery.* 2014;21:89–93.
21. Labbe D, Franco RG, Nicolas J. Platysma suspension and platysmaplasty during neck lift: anatomical study and analysis of 30 cases. *Plast Reconstr Surg.* 2006;117:2001–2007 discussion 2008-2010.
22. Bazaz R, Lee MJ, Yoo JU. Incidence of dysphagia after anterior cervical spine surgery: a prospective study. *Spine (Phila Pa.* 1976;2002(27):2453–2458.
23. Cloward RB. The anterior approach for removal of ruptured cervical disks. *J Neurosurg.* 1958;15:602–617.
24. Smith GW, Robinson RA. The treatment of certain cervical-spine disorders by anterior removal of the intervertebral disc and interbody fusion. *J Bone Joint Surg Am Vol.* 1958;40-A:607–624.
25. Jung A, Schramm J. How to reduce recurrent laryngeal nerve palsy in anterior cervical spine surgery: a prospective observational study. *Neurosurgery.* 2010;67:10–15 discussion 15.