Original Article

Option for transverse midline incision and other factors that determine patient's decision to have cervical spine surgery

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ABSTRACT

Background: Authors aim to determine patients' preference for surgical incision and factors affecting the decision for surgery to the anterior neck.

Methods: A questionnaire was presented prior to evaluation and if preceded to surgery followup given.

Results: 243 patients completed questionnaire, with 60% female population and younger than 50 years. 151 patients preferred a transverse midline incision with a statistically significant increase in outcomes and cosmesis importance and a decrease in the importance of board certification.

Conclusion: Findings of questionnaire demonstrate that patients' prefer a transverse midline anterior neck incision, with surgical outcomes being the overall factor affecting decision making.

1. Introduction

The anterior approach to cervical spine surgery has become the standard for the treatment for degenerative disc, traumatic herniated disc, and fracture dislocation.^{1–3} Cloward,¹ Smith and Robinson⁴ have devised operative techniques with modifications by several surgeons since 1958.^{5–11} There are varying types of skin incisions for cervical spine surgery; the incision is either on the right or left side of the trachea based on the surgical approach to the recurrent laryngeal nerve.^{12–15} Other factors determining the type of incision include a number of pathological levels affected,^{16,17} if corpectomy is required^{18,19} and whether affected segments are contiguous.²⁰

Transverse midline incisions have been used by other surgical specialties such as ENT, vascular, and general surgeons.^{21–23} This incision provides a more cosmetically acceptable result and allows for access to structures during surgery; however, few studies discuss the relevance of cosmesis.^{24–28} There are several named guidelines for determining surgical incision, most notably, Langer's lines.^{29,30} A transverse midline incision would, however, follow the guideline by Kraissl,³¹ where the incision is made in a skin crease. The quality of surgery is judged immediately by the amount of relief of symptoms and the cosmetic

appearance of the surgical site by the patients and relatives as patients cannot readily visualize the true extent of the surgery. The question remains if a transverse midline incision can be used for spine surgery and whether this type of incision is preferred by potential candidates for anterior cervical surgery.

With ongoing changes in patient-driven care, the types of procedures offered to treat the same pathology, as well as recent trends in the increase in ambulatory surgery center (ASC) use,^{32–38} the authors felt it prudent to devise a questionnaire with the primary goal of determining the preferences of the patients. The secondary goal was to determine factors which lead to the decision to have anterior cervical spine surgery.

2. Methods

Patients who presented to spine surgery clinic with the complaint of neck pain were presented with the questionnaire illustrated in Fig. 1. The questionnaire was given to all patients regardless of whether they would proceed to spinal surgery or not. Consenting patients completed the questionnaire prior to being assessed by the surgeon in order to minimize any bias resulting from evaluation and treatment. The

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Patient Incision and Decision Questionnaire

Date ____/____/____

Age: ☐ 18-35 ☐ 36-50 ☐ 51-65 ☐ 66-80 ☐ >80Gender: ☐ Male ☐ FemaleHave you had previous neck surgery? ☐ Yes ☐ No If yes, where? ☐ Hospital ☐ Outpatient CenterDo you have any close family members who had neck surgeries in the past? ☐ Yes ☐ NoIf yes, where was surgery performed? ☐ Hospital ☐ Outpatient Surgery CenterDo you have any previous knowledge of anterior neck incisions? ☐ Yes ☐ NoDo you know which anterior neck incision is used at this institute? ☐ Yes ☐ No

If you were to choose an incision in the neck. Refer to picture

What would you prefer? ☐ Right ☐ Middle ☐ Left

On a scale of 1-10:

A. How important is the surgeon's experience (Board Certification) for surgery being performed?

Not Important 1 2 3 4 5 6 7 8 9 10 Very Important

B. How important is the look of your scar (cosmesis)?

Not Important 1 2 3 4 5 6 7 8 9 10 Very Important

C. How important are postoperative photograph for reference in decision to have cervical spine surgery?

Not Important 1 2 3 4 5 6 7 8 9 10 Very Important

D. How important are patient reviews in deciding to have cervical spine surgery?

Not Important 1 2 3 4 5 6 7 8 9 10 Very Important

E. How important is level of improvement (outcomes) in decision to have cervical spine surgery?

Not Important 1 2 3 4 5 6 7 8 9 10 Very Important

F. How important are complication rates in decision to have cervical spine surgery?

Not Important 1 2 3 4 5 6 7 8 9 10 Very Important

G. How important is finances and cost in decision to have surgery?

Not Important 1 2 3 4 5 6 7 8 9 10 Very Important

Fig. 1. Questionnaire with factors assessing decision.

questionnaire consisted of questions about demographic information, history of neck incisions, incision preference, and factors affecting the decision for surgery (importance questions).

Information regarding the types of incision, why incisions varied, and the incision used by attending surgeon was not provided as an experimental measure to limit any possible bias. This limited patients feeling obligated to answer questions in a favorable manner to the surgeon or members of his staff. Patients who proceeded to undergo surgery at this were given educational classes and informed of the surgical outcomes, complications, and the incision used at this institute. Patients were only considered for surgery after failed conservative management for at least six weeks. 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, degenerative disc disease with instability and facet arthritis, tropism or facetogenic pain. Exclusion criteria for the

study included cervical spine surgery requiring three or more levels, patients who had previously undergone a corpectomy, acute severe trauma, fractures, malignancy, infection, unstable chronic medical illnesses, prior anterior cervical fusions or total disc replacement, and BMI > 42.^{39,40} Patients were followed in the immediate postoperative period; at the 3 months follow up, the patients were given a follow-up questionnaire with factors affecting decision (importance questions).

2.1. Statistical analysis

Statistical analysis was performed using SPSS v22 (IBM Corporation, New York, USA). Chi-squared used for categorical data. Continuous data comparisons were expressed as means with standard deviation. Tests were considered significant if $p < 0.05$ and analyzed using student *T*-test and ANOVA.

Table 1
Demographic and questionnaire data of patients prior to surgery (N = 243).

Age	N = 243	Percentage	Gender	N = 243	Percentage
18–35	63	26%	Male	97	40%
36–50	83	34%	Female	146	60%
51–65	58	24%	FMH Neck Surgery	N = 243	Percentage
66–80	39	16%	Non	235	97%
> 80	0	0	Yes	8	3%
Previous Neck Surgery	N = 243	Percentage	Knowledge of Institutes Incision	N = 243	Percentage
Non	233	96%	Non	219	90%
Yes	10	4%	Yes	24	10%
Prior Knowledge of Incisions	N = 243	Percentage	Incision Preference	N = 243	Percentage
Non	207	85%	Middle	151	62%
Yes	36	15%	Right	53	22%
			Left	39	16%

Abbreviations:

FMH: family history.

3. Results

Of the 250 patients who were invited to participate, 243 completed the questionnaire (97%) prior to being evaluated as a surgery candidate. A total of 75 patients (31%) had anterior cervical spine surgery with a total of 102 levels performed (Table 1). Of the population surveyed, 60% were female, and the majority of the patients were younger than 50 years of age (60%). A total of 233 patients had no previous history of neck surgery, of the remaining, 6 had surgery in the ASC and 4 in the hospital. This was also similar for patients who had relatives with no previous neck surgery: 235 patients, of the remaining there were 4 in each respective setting. There was no significance demonstrated in patients with negative or positive contributing history, $p = 0.81$ (Table 2). There was no significance demonstrated with persons with prior knowledge of types of incisions and the incisions used at this institute, $p = 0.12$ (Table 2).

A total of 151 patients preferred a transverse midline incision, compared to right (53 patients) and left (39 patients), illustrated in Fig. 2. For the group presented with the questionnaire prior to being evaluated and educated on surgery, procedures were ranked from highest to lowest, with board certification (surgeon experience) being the most important factor. The factors for the group of patients post-surgery were ranked from highest to lowest, with improvement (outcomes) being the most important factor. There was a statistically significant increase in the importance of both outcomes and cosmesis; however, a statistically significant decrease in the importance of board certification (Table 3). Decision choice was highly dependent on outcomes, $R = 0.91$, with significance demonstrated $p < 0.001$.

Table 2
Overall contributing history of neck surgery and prior knowledge of incisions.

	H/O neck surgery	FMH neck surgery	K/O Types of incision	K/O Institutes Incision
Non	233	235	207	219
Yes	10	8	36	24
p-value (χ^2)	0.81		0.13	

Abbreviations:

H/O: history of.

K/O: knowledge of.

4. Discussion

This study aimed to determine patients' preferences, and factors affecting decision prior to surgery, post education, and anterior cervical surgery. Bias was limited in the group presented with the questionnaire prior to surgery by questions aimed to determine previous personal and family history as well as prior knowledge of types of anterior neck incisions. No bias to incision was demonstrated as approximately 96% of patients had no contributing personal or family history and an average of 88% had no prior knowledge of types of incision performed at this institute. Board certification (surgeon experience) was the most important factor in the prior group to surgery with outcomes being the second most factor for decision making. There was a noted a statistically significant increase in outcomes and cosmesis in the group who had surgery, with a statically significant decrease in the importance of board certification.

This study demonstrates that, overall, patient outcomes are the main factor in arriving at a decision for surgery. We note that the experience of the surgeon as understood prior to surgery, and cosmesis after surgery are other factors patients use in reaching a decision to have surgery. A transverse midline incision is the preferred incision prior to surgery and can be performed to obtain satisfactory cosmetic results Fig. 3.

Healthcare is a specialty based on the quality of service provided and is a part of an integrated approach involving patients' decisions.⁴¹ This questionnaire adds to the armamentarium of knowledge as it relates to spine surgery and what patients prefer as it relates to their incision and admission for spine surgery. A study by Chin et al²⁰ demonstrated adequate exposure using two transverse midline incisions for anterior cervical surgery, however, cosmesis was not mentioned with the use of Less Exposure Surgery (LES) techniques.

Our study was not without limitations. First, questionnaire respondents were patients of a single institute's private practice. As such, our findings may not be representative of all patients in other orthopedic practices and geographic regions. Second, there were no previous published standards to reference questionnaire development. Third, although comparing numerical rating of incisions questions did show significance, we did not directly rank which one was more important. This study is also limited to looking directly at types of incisions used for anterior cervical spine procedures.²⁰

Further investigations should focus on acquiring more generalizable results across multiple academic and private orthopedic and neurosurgery practices. Future prospective studies of patients undergoing spine surgery with the three types of incisions can be performed and satisfaction assessment of cosmesis and outcomes including recurrent laryngeal nerve damage performed.

5. Conclusion

Our findings demonstrate that patients' prefer a transverse midline anterior neck incision, from a board-certified surgeon, with patient outcomes the overall factor affecting decision making. It is pertinent that surgeons discuss the surgical approach, outcomes, type of incision used and factors which contribute to decision for surgery to integrate patients' into their surgical management.

Conflicts of interest and sources of funding

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Fig. 2. Pie chart illustrating preference of incision location.

Table 3

Factors affecting decision and intergroup significance.

Factor	Prior Surgery Group Score	Post Surgery Group Score	Intergroup p-value
Outcomes (Improvement)	8.23 +/− 0.13	9.19 +/− 0.14	< 0.001
Cosmesis (Scar)	8.11 +/− 0.14	9.04 +/− 0.15	< 0.001
Board Certification	9.49 +/− 0.05	8.93 +/− 0.16	< 0.001
Complication	8.15 +/− 0.14	8.20 +/− 0.23	0.318
Reviews	8.21 +/− 0.14	7.99 +/− 0.27	0.899
Finances (Cost)	8.07 +/− 0.13	7.89 +/− 0.25	0.533
Photograph	7.37 +/− 0.16	7.87 +/− 0.29	0.985

Fig. 3. Photograph of anterior midline neck incision.

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