

Assessment of the Quality of Information of YouTube Videos Regarding Cervical Disc Replacement

Tanushk Luke Brito Martyn and Joseph Frederick Baker

Int J Spine Surg 2022, 16 (2) 272-277

doi: <https://doi.org/10.14444/8214>

<https://www.ijssurgery.com/content/16/2/272>

This information is current as of May 17, 2025.

Email Alerts Receive free email-alerts when new articles cite this article. Sign up at:
<http://ijssurgery.com/alerts>

Assessment of the Quality of Information of YouTube Videos Regarding Cervical Disc Replacement

TANUSHK LUKE BRITO MARTYN, MBChB¹ AND JOSEPH FREDERICK BAKER, MCh, FRCSI^{1,2}

¹Department of Orthopaedic Surgery, Waikato Hospital, Hamilton, New Zealand; ²Department of Surgery, University of Auckland, Auckland, New Zealand

ABSTRACT

Background: Patients have been shown to use YouTube as a source of information regarding medical procedures. There is currently limited information regarding the quality and educational content of information regarding cervical disc replacement (CDR). The purpose of this study was to determine the quality and educational content of YouTube videos on CDR using a procedure-specific scoring system.

Methods: A search was performed on YouTube using the phrase “cervical disc replacement.” The first 50 videos were included in this study. Video data were collected, including the title, duration, provider type, number of views, days since upload, number of comments, and the number of likes and dislikes. The videos were also assessed using the *JAMA* and Global Quality Score criteria for video quality and educational content, as well as a cervical disc replacement-specific score (CDRSS) was devised for this study.

Results: The average number of views was 73785.2. The average video duration was 5.9 minutes. Overall, video quality and educational content were low. The largest proportion of videos was classified as “surgeon professional” at 32%. The average CDRSS was 4.7. None of the quality measure scores recorded correlated with video variables.

Conclusion: Videos concerning CDR were available for review on YouTube. The educational quality and reliability of these videos were low.

Clinical Relevance: We suggest that other sources of information be utilized by patients and surgeons as an adjunct for education and informed consent regarding CDR.

Level of Evidence: 6.

Cervical Spine

Keywords: cervical disc replacement, cervical spine, patient education as topic

INTRODUCTION

As the breadth of content on the internet continues to expand and change the world we live in, so does its ability to act as a source of credible health information. As of January 2021, 59.5% of the global population used the internet on a regular basis.¹ YouTube (<https://www.youtube.com/>) is the second most popular social media platform² with over 2 billion user visits per month. It is accessed in more than 100 countries around the world and viewed in 80 different languages. More than 500 hours of video are uploaded every minute³ with more than a billion hours of video viewed every day. The average viewer aged 18 years or older spends 41.9 minutes on YouTube daily.⁴

There is a burgeoning library of health-related content on YouTube.^{5–17} The site is easily accessible to all potential patients and therefore may often be the first website visited if they are looking for information. It is thought that in the coming years, video-based information will be a primary source of data delivery, highlighting the growing importance for video quality

accuracy.^{7,17} More patients now turn to the internet as their first source of health information.¹⁸ This has had the direct benefit of empowering the patient so they feel more involved in their health care and the decision-making associated with it. However, it must be remembered that in almost all cases, health information online will not go through the same stringent protocol as is required for academic papers. Of note, YouTube videos require no peer review (or any actual regulation) prior to upload.^{5,18} As patients aim to educate themselves about potential procedures, prior to visiting a health practitioner, it is important to analyze which videos are currently available to understand what information patients are receiving.

Degenerative diseases of the cervical spine may be addressed by a variety of procedures. This depends on a number of variables, including patient, surgeon, and disease-specific features. These well-known procedures, among others, include anterior cervical discectomy and fusion (ACDF) and cervical disc replacement (CDR).¹⁹ CDR is newer than ACDF, originating in the

1960s as a means of minimizing adjacent segmental disease, which is a well-recognized problem following fusion.²⁰ Its clinical benefits over the “gold standard” ACDF continue to be explored. While early devices had higher complication rates and poorer results, technological advancements have led to a selection of implants with excellent midterm results.¹⁹

CDR is extensively marketed on the internet, and anecdotally many patients will research their condition and present seeking CDR in preference to a fusion.²¹ Previous reports on the quality of YouTube-based health-related information have shown varying results. Therefore, our aim was to determine the quality and educational content of YouTube videos on CDR using a specific scoring system we devised for this study. Our hypothesis was that the quality and educational content of the videos would be low.

METHODS

On 19 March 2021, YouTube’s search engine was queried with the keywords “cervical disc replacement.” The search was conducted at an independent internet cafe, so no biases associated with previous searches of the primary author could be associated with the study. The search was performed in Hamilton, New Zealand. Only videos in English were considered for this study. The first 50 videos based on this particular search were recorded. The decision to review only the first 50 videos was made because previous peer-reviewed articles that have analyzed orthopedic YouTube videos followed the same format.^{5,6,8,10,22}

Immediately after the initial search had been made, the following data were recorded: title, video duration, number of views, days since upload, view ratio (views divided by days since upload), number of comments, number of likes, number of dislikes, like ratio (likes × 100/like + dislike), and the Video Power Index (VPI). The VPI is a calculation determined from the formula like ratio × view ratio/100. This formula takes into account the number of times a video has been viewed and the total “likes” it has received, thus allowing a standardized method of determining its popularity.¹⁰

The videos’ contents were analyzed using the CDR-specific score (CDRSS) we devised for this study (Table 1). It was based on the seminal paper by Mathur et al and their Scoliosis-Specific Score.²³ Further orthopedic articles have followed in a similar style with their own modified versions to reflect their topic analysis.^{6,8,10,13,16,17,22} By following these examples, we modified and devised a score to highlight information we felt was important and beneficial for patients to

Table 1. Cervical disc replacement-specific score (CDRSS).

Category	Variable	Points		
Causes and presentation	Disc disease	3		
	Cervical myelopathy Cervical radiculopathy			
Indications	Unresponsive to conservative treatment	3		
	Single-level or 2-level disease Age >18 y			
Contraindications	Axial neck pain as only ailment	9		
	Spondylosis			
	Disc height <3 mm			
	Kyphotic deformity >15°			
	Active infection			
	Known malignancy			
	Inflammatory spondyloarthropathy			
Benefits	Maintenance of spinal motion	4		
	Rapid recovery			
	Shorter hospital stay			
	Decreased risk of ASD			
Complications	Infection	12		
	Bleeding/hematoma			
	Dysphagia			
	Dysphonia			
	Esophageal/tracheal injury			
	Dural tear			
	Recurrent laryngeal nerve injury			
	Spinal nerve injury			
	Spinal cord injury			
	ASD			
	Implant-related failures			
	Heterotopic ossification			
	Treatment options		Conservative management	5
			Anterior cervical discectomy and fusion	
Posterior laminoforaminotomy				
Laminoplasty Laminectomy with fusion				
Surgical technique	Approach	4		
	Discectomy			
	Decompression			
	Insertion of cervical disc replacement			
		40 points total		

Abbreviation: ASD, adjacent segmental disease.

comprehend about CDR prior to consenting for surgery. The key components of the informed consent process as outlined by Todd et al²⁴ were considered when developing the CDRSS. It was split into 7 categories: (1) causes and presentation; (2) indications; (3) contraindications; (4) benefits; (5) complications; (6) treatment options; and (7) surgical techniques. Each category had a number of variables associated with it, and each variable was assigned 1 point. The maximum total score a video could receive was 40.

The *JAMA* benchmark criteria were used to assess the accuracy and reliability of the videos in this study. *JAMA*’s benchmark criteria are a nonspecific and objective tool consisting of 4 individual criteria: authorship, attribution, currency, and disclosure. Online videos and resources can be analyzed via this benchmark to assess their accuracy and reliability. The reviewer assigns

Table 2. JAMA benchmark criteria.

Criteria	Description
Authorship	Author and contributor credentials and their affiliations should be provided.
Attribution	Clearly lists all copyright information and states references and sources for content.
Currency	Initial date of posted content and subsequent updates to content should be provided.
Disclosure	Conflicts of interest, funding, sponsorship, advertising, support, and video ownership should be fully disclosed.

1 point for each fulfilled criterion present. A score of 0 indicates a poor source accuracy and reliability; a score of 4 indicates high source accuracy and reliability (Table 2).²⁵ While these criteria are not validated, they have been used in nearly all studies of this nature.^{5-8,10,12,13,16,17,22}

General educational content (not specific to CDRSS) was assessed via the Global Quality Score (GQS). This is another nonvalidated tool that is commonly used to assess the content of online resources. It is summarized in Table 3.^{8,10} There are 5 potential grades to assign to a video. Score 1 is a video of poor quality; it is considered that a video with this score is unlikely to be of any use for patient education. Score 5 is a video of excellent quality and thought to be highly useful to patients.^{6,8,10,22}

The type of video was stratified into 5 different categories: surgeon professional, academic, commercial, nonsurgeon professional, and unspecified. These determinants were made by the first author with any uncertain classifications clarified by the senior author. Surgeon-professional videos had a surgeon either showing how a CDR is inserted or talking about the process. Academic videos were panel-type or group-type discussions involving surgeons analyzing the available research regarding the CDR. Commercial videos were advertisements from a company regarding their specific CDR. Nonsurgeon-professional videos included any health professional, who was not a spinal surgeon, discussing the CDR. Unspecified videos included all videos that did not fit into the prior categories, including features such as patient testimonials regarding the CDR.

Statistical Methods

All data were recorded and stored in an Excel spreadsheet. Results are reported as mean (\pm SD) and range as needed. Pearson correlation analyses were performed to determine significant association. One-way analysis

of variance was used to compare subgroups. Statistical significance was accepted as $P < 0.05$.

RESULTS

The 50 videos included in this study are shown in Table 4. The mean number of views per video was 73785.2 ± 391662.7 (range 323–2,781,849). The mean video duration was 5.9 ± 5.9 minutes (range 1.1–29). Additional video characteristics are summarized in Table 5.

Surgeon-professional videos made up the largest proportion for type of video at 32%. This was followed by commercial (28%), unspecified (20%), and academic (16%). Nonsurgeon-professional videos made the lowest proportion at 4%. The mean CDRSS score was 4.7 ± 3.6 (range of 0–20). The mean JAMA score was 1.1 ± 0.3 (range 1–2). The mean GQS score was 1.9 ± 0.7 (range 1–3). None of the quality measure scores recorded correlated with video variables. In particular, video views, run time, like ratio, VPI, or type of video had no statistical significance in regard to its quality measure score.

DISCUSSION

The aim of this study was to determine the quality and educational content of YouTube videos on CDR. Our study showed that the first 50 videos available to a user who searches on YouTube with the keywords “cervical disc replacement” were of poor quality and educational content when assessed with the scoring tools CDRSS, JAMA, and GQS. Of particular importance, these videos could not be reliably used to supplement or be considered a useful adjunct to the process of informed consent.²⁴

Previous spine-related articles with a comparable method have arrived at similar conclusions. Brooks

Table 3. The Global Quality Score criteria.

Grading	Description of Quality
1	Poor quality; is unlikely of be to use for patient education.
2	Poor quality; is of limited use to patients because only some information is present.
3	Suboptimal quality and flow; is somewhat useful to patients; important topics are missing, some information is present.
4	Good quality and flow; useful to patients because most important topics are covered.
5	Excellent quality and flow; is highly useful to patients.

Table 4. All 50 YouTube URLs (web addresses) included in this study.

Rank	YouTube URL
1	https://www.youtube.com/watch?v=q6lXuwewdRY
2	https://www.youtube.com/watch?v=0elU7dz2VEM
3	https://www.youtube.com/watch?v=JZy4M22MckU
4	https://www.youtube.com/watch?v=fybwGPU-Tag
5	https://www.youtube.com/watch?v=bNqrD1VItkk
6	https://www.youtube.com/watch?v=7RKJg0agjb4
7	https://www.youtube.com/watch?v=6ZJX_NqsrB4
8	https://www.youtube.com/watch?v=Ca6pCcFT6D4
9	https://www.youtube.com/watch?v=nPhKA8V8NpM
10	https://www.youtube.com/watch?v=32CUEdquinc
11	https://www.youtube.com/watch?v=uWign1-e2zI
12	https://www.youtube.com/watch?v=3DS80r7Vlek
13	https://www.youtube.com/watch?v=DP6OUfD4NP0
14	https://www.youtube.com/watch?v=Qy3iTp894iw
15	https://www.youtube.com/watch?v=7O98Bx5UFzs
16	https://www.youtube.com/watch?v=VIVYjrkLVxI
17	https://www.youtube.com/watch?v=enkaJaeMQa4
18	https://www.youtube.com/watch?v=CtaUCINGi5k
19	https://www.youtube.com/watch?v=-0pPCC9bbbg
20	https://www.youtube.com/watch?v=9y27BJWLT9Q
21	https://www.youtube.com/watch?v=oVlSgfWnufa
22	https://www.youtube.com/watch?v=L07eFeUCELA
23	https://www.youtube.com/watch?v=4ZV9u0gcmII
24	https://www.youtube.com/watch?v=PhgXmnUPBPg
25	https://www.youtube.com/watch?v=nRCVx-OKAms
26	https://www.youtube.com/watch?v=ePR2DnQ-694
27	https://www.youtube.com/watch?v=Pcld_1B3f0I
28	https://www.youtube.com/watch?v=osD-_v18hho
29	https://www.youtube.com/watch?v=z4JRC3gelcg
30	https://www.youtube.com/watch?v=Nmkkp-PY5bc
31	https://www.youtube.com/watch?v=y7KfBlnXP8Y
32	https://www.youtube.com/watch?v=OucZmsresil
33	https://www.youtube.com/watch?v=rFEAqINLRCo
34	https://www.youtube.com/watch?v=v7WGIum3-oU
35	https://www.youtube.com/watch?v=1PG3221Z5MM
36	https://www.youtube.com/watch?v=7sZyN-vK--A
37	https://www.youtube.com/watch?v=Mox6aNKRGXo
38	https://www.youtube.com/watch?v=Q_35A1pa9kI
39	https://www.youtube.com/watch?v=dNy1J5Y42o8
40	https://www.youtube.com/watch?v=aiRfUfXJQJQ
41	https://www.youtube.com/watch?v=RSRD1ks5WhQ
42	https://www.youtube.com/watch?v=RGeY2s5ZPFY
43	https://www.youtube.com/watch?v=OrxcPUBvqLk
44	https://www.youtube.com/watch?v=a-S_-B6h0BI
45	https://www.youtube.com/watch?v=MJibe4D9uwk
46	https://www.youtube.com/watch?v=lmRhn5L_ETU
47	https://www.youtube.com/watch?v=Ee0tVxXnSpA
48	https://www.youtube.com/watch?v=75gcdBEE3eU
49	https://www.youtube.com/watch?v=g_4VjlymjeY
50	https://www.youtube.com/watch?v=1K6ZPqTLgY

et al¹⁴ studied lumbar discectomy videos, Staunton et al²² studied scoliosis videos, and Ovenden et al⁵ studied ACDF videos, all on YouTube. All articles

Table 5. Video characteristics of the YouTube videos included in this study.

Variable	Mean	SD	Minimum	Maximum
Video duration, min	5.9	5.9	1.1	29
Views	73,785.3	391,662.7	323	2,781,849
Days since upload	1475.5	1177.6	232	4413
View ratio	31.0	105.3	0.3	747
Comments	11.6	21.6	0	108
Likes	252.2	1136.9	0	8084
Dislikes	30.5	172.3	0	1222
Like ratio	87.4	23.6	0	100
Video Power Index	27.6	91.7	0	649.6

showed that their respective videos were of poor quality and educational content. This is a worrying trend. Patients reportedly see the internet, and video content specifically, as a primary source of information for their health education.^{7,17,18} The distinct lack of quality videos means that a large majority of patients will continue to be inadequately educated about their health concerns. This can have deleterious influence on the informed consent process. The greatest concern is that if assumptions are made that patients have been adequately educated by watching YouTube videos we sampled, the likelihood is that a large majority are not receiving the appropriate counseling prior to a CDR procedure. Additional patient education, face to face, is mandatory to correct any misconceptions gained from accessing information on YouTube.

The CDRSS was designed with patient education and informed consent as its primary aim. Todd et al²⁴ detailed a specific checklist in their paper that spinal surgeons should aim to fulfill in order to adequately prepare a patient for routine elective surgery. In particular, informed consent should address the proposed procedure; the natural history of the condition if left untreated; the risks, benefits, and alternatives to surgery; and if there were any nonoperative treatments to surgery.²⁴ Todd et al also documented spinal surgery cases where the operation was carried out to an appropriate standard, but the patient was successful in a claim against the surgeon/institution that the surgery occurred despite inadequate counseling/preparation. In one particular case, the patient was referred to a website that did not contain information that one of the risks of that particular spinal surgery was potential damage to the spinal cord. With this in mind, we aimed to make the CDRSS as comprehensive and patient-centric as possible when addressing all potential items that should be addressed for informed consent in CDR surgery. Our results are clear that information regarding CDR on YouTube can only poorly complement the informed consent process, if at all.

This poses issues for the spinal surgeon looking to use YouTube as an educational supplement or information adjunct for their patient prior to CDR surgery. Good quality, patient-centric videos that are produced with informed consent in mind were not apparent in our YouTube search. Only 1 video, entitled “Risks of surgery on the neck—ACDF and cervical disc replacement”²⁶ specifically touched on complications. If surgeons wish to use YouTube for the

mentioned reasons, we recommend they search for and collect a set of CDR videos currently available that addresses as many of the 40 variables on the CDRSS. They could also create and upload their own video, which has the added benefit of reflecting their local culture and treatment trends.

The main limitation with our study was that only the first 50 videos were assessed. While it has been shown that most internet users do not go past the first 2 pages of a search result,²⁷ our findings must still take into account that a specific well-made video might not have been viewed by us. Our search query was also only performed in the English language, and therefore videos about CDR in another language were not assessed. The findings of this study may have limited applicability beyond the English-speaking world.

Video quality was also only analyzed using CDRSS, JAMA, and GQS. These criteria often meant that patient-testimonial videos received low grades as they had no real clinical information. We acknowledge that the benefit a patient might receive from hearing a testimonial from another patient is significant. There could be a place for videos like these in conjunction with videos of better information quality.

CONCLUSION

Videos concerning CDR on YouTube were of poor educational quality and reliability. They cannot reliably complement the informed consent process. We recommend that other sources of information be utilized by patients and surgeons as an adjunct for education and informed consent regarding this procedure.

REFERENCES

1. Internet users in the world 2021. *Statista* [May 23, 2021]. <https://www.statista.com/statistics/617136/digital-population-worldwide/>.
2. Most used social media 2021. *Statista* [Accessed May 23, 2021]. <https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>.
3. YouTube for Press. *Blog.Youtube* [Accessed May 23, 2021]. <https://blog.youtube/press/>.
4. 25 YouTube Statistics that May Surprise You. *2021 Edition* [Accessed May 23, 2021]. <https://blog.hootsuite.com/youtube-stats-marketers/>.
5. Ovenden CD, Brooks FM. Anterior cervical discectomy and fusion YouTube videos as a source of patient education. *Asian Spine J*. 2018;12(6):987–991. doi:10.31616/asj.2018.12.6.987
6. Erdem MN, Karaca S. Evaluating the accuracy and quality of the information in kyphosis videos shared on YouTube. *Spine*

- (*Phila Pa 1976*). 2018;43(22):E1334–E1339. doi:10.1097/BRS.0000000000002691
7. Akpolat AO, Kurdal DP. Is quality of YouTube content on bankart lesion and its surgical treatment adequate? *J Orthop Surg Res*. 2020;15(1):78. doi:10.1186/s13018-020-01590-0
8. Kunze KN, Krivicich LM, Verma NN, Chahla J. Quality of online video resources concerning patient education for the meniscus: a YouTube-based quality-control study. *Arthroscopy*. 2020;36(1):233–238. doi:10.1016/j.arthro.2019.07.033
9. Yadav AK, Prasanna Kumar GS, Khanna V. YouTube - An unreliable source of information for Total hip replacement. *J Clin Orthop Trauma*. 2021;13:82–84. doi:10.1016/j.jcot.2020.08.010
10. Kunze KN, Cohn MR, Wakefield C, et al. YouTube as a source of information about the posterior cruciate ligament: a content-quality and reliability analysis. *Arthrosc Sports Med Rehabil*. 2019;1(2):e109–e114. doi:10.1016/j.asmr.2019.09.003
11. D'Souza RS, D'Souza S, Strand N, Anderson A, Vogt MNP, Olatoye O. YouTube as a source of medical information on the novel coronavirus 2019 disease (COVID-19) pandemic. *Glob Public Health*. 2020;15(7):935–942. doi:10.1080/17441692.2020.1761426
12. Wong M, Desai B, Bautista M, Kwon O, Kolodychuk N, Chimento G. YouTube is a poor source of patient information for knee arthroplasty and knee osteoarthritis. *Arthroplast Today*. 2019;5(1):78–82. doi:10.1016/j.artd.2018.09.010
13. Cassidy JT, Fitzgerald E, Cassidy ES, et al. YouTube provides poor information regarding anterior cruciate ligament injury and reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2018;26(3):840–845. doi:10.1007/s00167-017-4514-x
14. Brooks FM, Lawrence H, Jones A, McCarthy MJH. YouTubeTM as a source of patient information for lumbar discectomy. *Ann R Coll Surg Engl*. 2014;96(2):144–146. doi:10.1308/003588414X13814021676396
15. Langford B, Hooten WM, D'Souza S, Moeschler S, D'Souza RS. YouTube as a source of medical information about spinal cord stimulation. *Neuromodulation*. 2021;24(1):156–161. doi:10.1111/ner.13303
16. Bruce-Brand RA, Baker JF, Byrne DP, Hogan NA, McCarthy T. Assessment of the quality and content of information on anterior cruciate ligament reconstruction on the internet. *Arthroscopy*. 2013;29(6):1095–1100. doi:10.1016/j.arthro.2013.02.007
17. Celik H, Polat O, Ozcan C, Camur S, Kilinc BE, Uzun M. Assessment of the quality and reliability of the information on rotator cuff repair on YouTube. *Orthop Traumatol Surg Res*. 2020;106(1):31–34. doi:10.1016/j.otsr.2019.10.004
18. Tan S-L, Goonawardene N. Internet health information seeking and the patient-physician relationship: a systematic review. *J Med Internet Res*. 2017;19(1):e9. doi:10.2196/jmir.5729
19. Leven D, Meaie J, Radcliff K, Qureshi S. Cervical disc replacement surgery: indications, technique, and technical pearls. *Curr Rev Musculoskelet Med*. 2017;10(2):160–169. doi:10.1007/s12178-017-9398-3
20. Buckland AJ, Baker JF, Roach RP, Spivak JM. Cervical disc replacement - emerging equivalency to anterior cervical discectomy and fusion. *Int Orthop*. 2016;40(6):1329–1334. doi:10.1007/s00264-016-3181-8
21. Qureshi SA, Koehler SM, Lin JD, Bird J, Garcia RM, Hecht AC. An evaluation of information on the internet about a new device: the cervical artificial disc replacement. *Spine (Phila Pa 1976)*. 2012;37(10):881–883. doi:10.1097/BRS.0b013e31823484fa

22. Staunton PF, Baker JF, Green J, Devitt A. Online curves: a quality analysis of scoliosis videos on YouTube. *SPINE (Phila Pa 1976)*. 2015;40(23):1857–1861. doi:10.1097/BRS.0000000000001137
23. Mathur S, Shanti N, Brkaric M, et al. Surfing for scoliosis: the quality of information available on the internet. *Spine (Phila Pa 1976)*. 2005;30(23):2695–2700. doi:10.1097/01.brs.0000188266.22041.c2
24. Todd NV, Birch NC. Informed consent in spinal surgery. *Bone Jt J*. 2019;101-B(4):355–360. doi:10.1302/0301-620X.101B4.BJJ-2018-1045.R2
25. Silberg WM, Lundberg GD, Musacchio RA. Assessing, controlling, and assuring the quality of medical information on the Internet: caveat lector et viewer--let the reader and viewer beware. *JAMA*. 1997;277(15):1244–1245. doi:10.1001/jama.1997.03540390074039
26. Dr David Oehme. *Risks of Surgery on the Neck - ACDF and Cervical Disc Replacement* [Accessed May 24, 2021]. 2018. <https://www.youtube.com/watch?v=9y27BJWLT9Q>.
27. Morahan-Martin JM. How internet users find, evaluate, and use online health information: a cross-cultural review. *Cyberpsychol Behav*. 2004;7(5):497–510. doi:10.1089/cpb.2004.7.497

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Declaration of Conflicting Interests: The authors report no conflicts of interest related to this work.

Corresponding Author: Tanushk Luke Brito Martyn, Waikato Hospital, 183 Pembroke St, Hamilton 3240, New Zealand; tanushk.martyn@gmail.com

Published 09 March 2022

This manuscript is generously published free of charge by ISASS, the International Society for the Advancement of Spine Surgery. Copyright © 2022 ISASS. To see more or order reprints or permissions, see <http://ijssurgery.com>.