KJA
Korean Journal of Anesthesiology

Distance of catheter tip dislocation in continuous interscalene brachial plexus block

Tatsuya Abe[1], Takashi Fujiwara[2], Yoshinori Kamiya[1]

Department of Anesthesiology, [1]Niigata University Medical and Dental Hospital, [2]Saiseikai Niigata Hospital, Niigata, Japan

Letter to the Editor

Korean J Anesthesiol 2022;75(1):97-99
https://doi.org/10.4097/kja.21227
pISSN 2005-6419 • eISSN 2005-7563

Received: May 29, 2021
Revised: June 13, 2021
Accepted: July 5, 2021

Corresponding author:
Tatsuya Abe, M.D.
Department of Anesthesiology, Niigata University Medical and Dental Hospital, 754, Ichibancho, Asahimachidori, Chuo-ku, Niigata-shi, Niigata 951-8510, Japan
Tel: +81-25-227-2328
Fax: +81-25-227-0790
Email: n21b102d@mail.cc.niigata-u.ac.jp
ORCID: https://orcid.org/0000-0003-3123-2632

Shoulder joint surgery is associated with severe postoperative pain, and continuous interscalene brachial plexus block (cISBPB) using a catheter is an effective treatment modality. Despite proper catheterization, cases of cISBPB with inadequate postoperative analgesia in the brachial plexus innervation area are occasionally encountered. Several studies have been conducted in an effort to reduce inadequate analgesia, such as the comparison of catheter insertion approaches [1–3]; however, there is no consensus on the best approach. Inadequate analgesia may be associated with postoperative catheter tip dislocation from the interscalene groove, which occurs during and after surgery. The frequency of catheter dislocation has been reported [4], and Aoyama et al. [5] recently reported that catheter tip dislocation decreased the analgesic effect of cISBPB. However, little information is available on how far the inserted cISBPB catheter migrated after surgery. In this study, we examined the amount of movement of the inserted catheter after surgery.

The study population included all patients who underwent shoulder surgery and cISBPB by the same anesthesiologist at Saiseikai Niigata Hospital from June 1, 2017 to December 31, 2017. The Ethics Review Board of Saiseikai Niigata Hospital approved this study (registration number: E17–12), and all enrolled patients provided written informed consent. Exclusion criteria were contraindications to continuous interscalene block, body mass index ≥ 30 kg/m^2, and American Society of Anesthesiologists physical status ≥ 3.

Preoperatively, the cISBPB catheter (Perifix® Soft Tip Catheter, B. Braun, Germany) was inserted between the C5 and C6 nerve roots using a posterior in-plane ultrasound-guided approach. Subsequently, agitated saline (0.5 ml of air and 3 ml of saline) was injected through the catheter to identify the catheter position by the hyperechoic flush from the proximal catheter pore in the interscalene space (Fig. 1A), and the images were stored in the internal hard disk of the ultrasound device. The inserted length of the catheter at the skin was recorded, and the catheter was sealed using 2-octyl cyanoacrylate (Aron Alpha® A, Daiichi Sankyo, Japan) and draped using sterile transparent tape (3M Tegaderm™ Film, 3M Health Care, USA). On postoperative day 1 in the ward, the catheter position was identified by hyperechoic flush using the same method, and the dislocation distance from the preoperative proximal catheter pore position was measured by comparison with the images stored on the hard disk (Fig. 1B). When measuring the distance, the preoperative proximal catheter pore position was set in reference to the surrounding anatomical structures, such as the anterior scalene muscle. Movement of the catheter toward the skin was expressed as a positive direction and the opposite direction as a negative direction. The dislocation rate and distance of catheter tip movement were the main outcome parameters. Dislocation was defined as a shallower catheter position than in the initial placement. The correlations between the distance of catheter tip dislo-

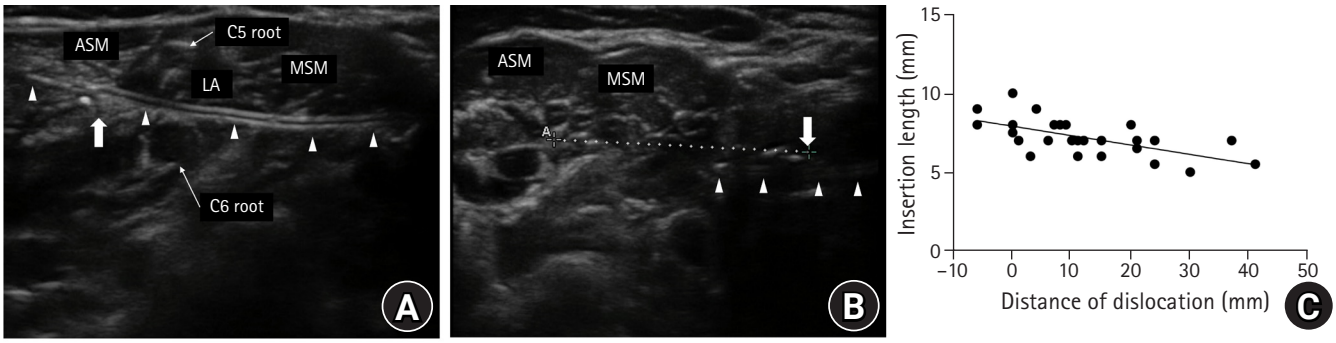

Fig. 1. Representative ultrasound images of posterior approached-continuous interscalene brachial plexus block at the catheter insertion day and the day after the catheter insertion. (A) The catheter was placed between the C5 and C6 nerve roots and beyond the interscalene space. (B) The catheter was retracted 2.3 cm from the initially placed position setting as A. The position of A in this figure was determined using the anterior scalene muscle as a guide. (C) There was a negative correlation between catheter insertion length and distance of dislocation (r = –0.66, 95% CI [–0.84, –0.37], P < 0.001). White arrow: most proximal port of the catheter available, identified by the hyperechoic flush induced by air, White triangle: catheter visible by ultrasound. ASM: anterior scalene muscle, MSM: middle scalene muscle, LA: local anesthetics.

cation and basic patient information, such as age, height, weight, and catheter insertion length, were also analyzed using the Spearman rank correlation coefficient. Values are presented as median (Q1, Q3). P values were two-sided, and statistical significance was defined as $P < 0.05$.

A total of 27 patients were included in the study, and no patients were excluded. The median age, height, weight, and catheter insertion length were 59 (38.5, 72) yr, 167 (160, 170.5) cm, 70.6 (62.1, 77.7) kg, and 70 (67.5, 80) mm, respectively.

The catheter insertion length did not change after surgery in all cases. Catheter tip dislocation was observed in 22 of 27 cases (81.5%), and the catheter tip was shallower by 11 (3.5, 20.5) mm. Only the insertion length was negatively correlated with the distance of catheter tip dislocation (r = –0.66, 95% CI [–0.84, –0.37], P < 0.001) (Fig. 1C).

We observed that catheter tip dislocation occurred frequently, and the mean dislocation distance was approximately 1 cm. We also found a negative correlation between the distance of catheter tip dislocation and catheter insertion length. From the results of our research, it is expected that a catheter will be more likely to stay in proper position if it is inserted approximately 1 cm deeper than the customary catheter insertion position to secure a margin for catheter movement. However, this could also lead to over-insertion of the catheter, which may increase the risk of complications or even dislodge the catheter tip from the interscalene space. It is safer to perform the above procedure while visualizing the catheter tip using ultrasound to avoid straying. The dislocation rate was 81.5%, which was more frequent than 20% of in-plane and 14% of out-of-plane[1], 5% of out-of-plane[4], 33.3% of in-plane and 40.7% of out-of-plane [5], reported in previous studies. However, this is due to our definition of dislocation. We included even the slightest catheter movement as dislocation, which may be due to the more sensitive assessment method in our study. However, we do not want to emphasize the measurement size itself, but to convey the fact that catheters can easily move inside the body even if the insertion length remains the same.

The main limitation of this study was the lack of standardization of various factors that may be associated with catheter dislocation, such as surgical procedures or patient rest levels, since shoulder and neck movements during and after surgery are considered to be related to catheter tip dislocation. The method of measuring the dislocation distance was also a limitation. Since the ultrasound images of the interscalene region were different before and after surgery, there is no guarantee that the pre- and postoperative comparisons were made accurately. In addition, the method may not accurately reflect dislocation because it is an indirect assessment that measures the hyperechoic region.

In conclusion, we must consider that catheter tip movement easily occurs and is approximately 1 cm in cISBPB. This study suggests that a longer insertion length may provide superior analgesia.

Funding

None.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

https://doi.org/10.4097/kja.21227

Author Contributions

Tatsuya Abe (Data curation; Formal analysis; Investigation; Methodology; Project administration; Software; Validation; Visualization; Writing – original draft; Writing – review & editing)
Takashi Fujiwara (Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Supervision)
Yoshinori Kamiya (Software; Supervision; Visualization; Writing – review & editing)

ORCID

Tatsuya Abe, https://orcid.org/0000-0003-3123-2632
Takashi Fujiwara, https://orcid.org/0000-0001-8657-3325
Yoshinori Kamiya, https://orcid.org/0000-0001-9790-9867

References

1. Schwenk ES, Gandhi K, Baratta JL, Torjman M, Epstein RH, Chung J, et al. Ultrasound-guided out-of-plane vs. in-plane interscalene catheters: a randomized, prospective study. Anesth Pain Med 2015; 5: e31111.
2. Fredrickson MJ, Ball CM, Dalgleish AJ. Posterior versus anterolateral approach interscalene catheter placement: a prospective randomized trial. Reg Anesth Pain Med 2011; 36: 125-33.
3. Tanijima M, Takechi K, Nakanishi K, Yorozuya T. Adverse events associated with continuous interscalene block administered using the catheter-over-needle method: a retrospective analysis. BMC Anesthesiol 2019; 19: 195.
4. Marhofer D, Marhofer P, Triffterer L, Leonhardt M, Weber M, Zeitlinger M. Dislocation rates of perineural catheters: a volunteer study. Br J Anaesth 2013; 111: 800-6.
5. Aoyama Y, Sakura S, Kitajo A, Saito Y. Incidence and effects of postoperative migration of interscalene catheter tips placed using ultrasound-guided anterior and posterior approaches. J Anesth 2021; 35: 175-83.