PŮVODNÍ PRÁCE

A comparison of medial cervical plexus block versus combined (superficial and deep) cervical plexus block for carotid endarterectomy: a prospective, randomized singleblind study

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ABSTRACT

Objective: To compare the standard method of combined (superficial and deep) cervical plexus block (SDCPB) with a medial cervical plexus block (MCPB). Design: A prospective, randomized, single blind study.
Setting: Department of Anaesthesiology and Intesive Care Medicine, Tertiary Hospital.
Material and methods: One hundred consecutive patients undergoing elective carotid endarterectomy (CEA) were randomized into two groups. The quality of the block, time to perform the block, nature and rate of complications and patient's as well as surgeon's satisfaction were assessed. Data was statistically analyzed using Pearson's $\chi 2$- and Mann-Whitney tests.
Results: The groups did not differ in the quality of the block and there was no difference in the need for additional sedation or topical anesthesia applied by the surgeon. Time to perform the SDCPB was 5.48 min compared with 2.28 min for MCPB. Puncture of adjacent blood vessels occurred in 7 cases of SDCPB and none in MCPB. Satisfaction with both methods of nerve block was excellent and both among patients and surgeons. The total dose of local anesthetic was significantly reduced in the MCPB group (12.5 mg bupivacaine and 15 mg trimecain vs 6 mg of bupivacaine).
Conclusion: The effectiveness of the medial cervical plexus block is comparable to the combined superficial and deep cervical plexus block. The risk of complications, dose of local anesthetic and procedural time favor the MCPB over SDCPB.

KEYWORDS

cervical plexus block – endarterectomy – ultrasound

SOUHRN

Cíl studie: Porovnat standardní metodu blokády cervikálního plexu (kombinace povrchního a hlubokého bloku (SDCPB) s mediálním ultrazvukem navigovaným blokem (MCPB).

Typ studie: Prospektivní, randomizovaná, slepá studie.
Materiál a metoda: Jedno sto, po sobě jdoucích pacientů, kteří se podrobili karotické endarterektomii (CEA) bylo rozděleno do dvou skupin. Byla sledována kvalita blokády, čas aplikace bloku, možné komplikace a jejich frekvence. Dále jsme zaznamenávali spokojenost pacientů

a operatérů. Data byla zpracována použitím Pearsonova chí kvadrát testu a Mannova-Whitneyova testu.
Výsledky: Skupiny se nelišily v kvalitě bloku, potřebě dodatečné sedace, ani v potřebě topického doplnění bloku aplikovaného operatérem. Aspirace krve byla zaznamenána v 7 případech pouze u hluboké blokády. Čas provedení bloku byl zhruba dvojnásobný u SDCPB (5,48 min) oproti MCPB (2,28 min.). Spokojenost pacientů i chirurgů s oběma metodami byla uspokojivá a statisticky se nelišila. Celková dávka lokálních anestetik byla u skupiny MCPB signifikantně nižší (12,5 mg bupivacainu a 15 mg trimecainu oproti 6 mg bupivacainu), což vyplývá ze zvolené metody.
Závěr: Efektivnost UZ navigovaného mediálního cervikálního bloku je srovnatelná s kombinací hlubokého a povrchního krčního bloku. Riziko komplikací, nižší dávka anestetika a kratší doba aplikace bloku favorizují použití mediálního bloku.

KLÍČOVÁ SLOVA

blokáda cervikálního plexus – endarterektomie – ultrazvuk

INTRODUCTION

Carotid endarterectomy (CEA) is often performed under local anaesthesia allowing continuous monitoring of neurologic status after clamping of the carotid artery. Combined superficial and deep cervical plexus block is the most commonly used regional anaesthetic method for CEA. Unfortunately, the deep cervical plexus block is associated with some serious complications such as local anaesthetic toxicity secondary to intravasal application or systemic absorption and high spinal block due to inadvertent intrathecal administration of the local anaesthetic [1, 2]. The superficial cervical plexus block is safer method and a preferred by some [3], but during this block often the investing fascia is being perforated leading to an actual medial cervical plexus block rather than superficial [4].

Based on reports by others as well as our previous research [4, 5, 6, 7], we introduced the medial cervical plexus block technique. The principle lies in the application of local anaesthetic under ultrasound guidance directly into the interfascia space [4, 6], where the cervical plexus is formed. We have compared this ultrasound-guided method with the standard stimulation needle guided SDCPB.

METHODS

Informed consent was obtained from the patients undergoing CEA from January to December 2011 and the study had approval from the Local Ehics Committee. Two groups each consisting of four anaesthetists performed the blocks; one group solely performed the DSCPB while the other group performed only the MCPB procedure. The anaesthetists from both groups were randomly allocated by pulling the procedurals' number out of a hat for the CEA operative list by an independent anaesthetist who was unaware of the patient's medical history, operative details and baseline characteristics. There were 50 patients in the group who received the SDCPB and 50 patients received the MCPB for their surgery. All patients were given fentanyl 0.1 mg before surgery and additional analgesia and sedation were documented.

SDCPB was performed as previously described [7, 8]. In brief, the superficial block was performed using a standard 22G needle (0.7 x 40 mm). The mixture injected was 15 ml of 0.5% bupivacaine plus 10 ml of 1% trimecaine.

Deep cervical plexus block was performed using a Stimuplex DR stimulating needle and the dose of anaesthetic used was 10 ml 0.5% bupivacaine with 5 ml 1% trimecaine applied in the vicinity of the C3 nerve root. The MCPB performed by the second group of anaesthetists was applied using ultrasound-guidance aiming specifically for the interfascia space [5]. Eighteen mls of 0.375% bupivacaine was injected into the interfascia space at the level of C3 vertebral body using a 22G needle (0.7 x 40 mm).

We recorded the need and amount of any additional sedation, analgesia or topical anaesthetic administered peri-operatively by the surgeon into the wound. All complications and surgeon's satisfaction at the end of operation were noted on a scale of 1 (complete satisfaction) to 5 (absolute dissatisfaction). Patient's satisfaction was recorded the morning after the operation using identical scale [9]. Data were statistically analysed using the Pearson χ^2 test and the time taken to perform the blocks was analysed using the nonparametric Mann-Whitney test.

RESULTS

The groups did not differ in the baseline characteristics including age, sex, operated side but differed in the ASA category although the requirement for blood pressure manipulation was similar in both groups. We also did not find any significant differences in the application of local anaesthetic during the surgery. Thirty six patients in each group equally required addition of local anaesthesia during the carotid surgery. Approximately half of the injection of additional local anaesthetic occurred during initial phases of surgery (subcutaneous tissue and muscle preparation) and half was

applied directly onto the carotid artery. The MCPB group required slightly more frequent addition of local anaesthetic by the surgeon directly onto the carotid artery, p = 0.388 while few more patients in the SDCPB group required additional local anaesthetic during surgical preparation, p = 0.761. Regardless of the cervical plexus block method no toxic reactions or undesired extension of the block were observed in any patient. Satisfaction of both patients (p = 0.294) and surgeons (p = 0.352) was similar between the two methods. The groups differed in the incidence of blood aspiration during application of the cervical plexus block. While none occurred in the MCPB group it happened in seven patients in SDCPB group, p = 0.006. As compared to SDCPB, the MCPB group received significantly lower total amount of local anaesthetic (12.5 mg bupivacaine and 15 mg trimecain vs. 6 mg of bupivacaine, p < 0.001). The average time needed to perform the block in the SDCPB group was 5 minutes 48 seconds vs. 2 minutes 28 seconds in the MCPB group, p < 0.001.

DISCUSSION

The aim of the study was to compare two methods of cervical plexus block; the combined superficial and deep cervical plexus block with the median cervical plexus block. We found that both methods are comparable with regards to patient and surgeon satisfaction while minimizing potential adverse events. Firstly, we found no incidence of blood aspiration in the MCPB group thus reducing possibility of intravascular administration of local anaesthetic and second, the total dose of local anaesthetic administered was lower both reducing the likelihood of local anaesthetic toxicity. There was no need for additional local anaesthetic administration by the surgeon in the MCPB group above those required in the SDCPB group in terms of both dose and number of patients that required additional local anaesthetic administration by the surgeon.

Our study has several limitations. Firstly, it is not a truly randomized study as two separate groups of anaesthetists performed each cervical plexus block method thus limiting the external validity of our results. However, the SDCPB was performed by specialist anaesthetists with substantial and longer experience with the method. Only one anaesthetist in the MCPB group had substantial experience with the performance of MCPB block. The other three anaesthetists had performed the MCPB less than five times previously.

In some patients superficial cervical block is associated with the leak of local anaesthetic underneath the medial (investing) cervical fascia and distributes in the interfascia space [4]. Also an unintended injection of local anaesthetic below the medial cervical fascia just below the sternocleidomastoid muscle is able to fill the interfascia space thus providing successful cervical plexus block. This may have led to overestimation of the SDCPB success rate nevertheless the incidence is hard to estimate and doesn't invalidate our results.

Medial cervical plexus block fulfils the principles of the fascia plane concept [7] where localization of the right space into which local anaesthetic is injected is more important than the distance of the tip of the needle from the nerve. Ultrasound guidance predominantly used to identify the target interfascia space rather then visualizing the nerve is essential for the successful block performance.

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