

Efficacy of Anesthetic Blockage of Superficial Branches of the Cervical Plexus

Eficacia del Bloqueo Anestésico de Ramos Superficiales del Plexo Cervical

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ABSTRACT: Regional anesthesia is of utility in facial and cervical territories, and is the basis that allows the performance of diverse surgical procedures and diagnostic tests. An important part of the cranial and cervical tegument is innervated by superficial branches of the cervical plexus, which can be blocked by infiltration of anesthetic in a unique point locatable in the lateral region of the neck. An anesthetic technique was executed for blockage of tegumentary branches of the cervical plexus in a test series conformed by 15 healthy adults. The anesthesia was verified by means of tactile, pain and temperature tests, in five points over the dermatomes of the cervical plexus. Complete anesthesia was verified in 14 of the 15 patients. In all cases the anesthesia lasted at least 90 minutes, and there were no accidents or major complications associated to the execution of the technique. The notable anesthetic effect and adequate working time, summed with the low risk of accidents and complications, make this technique a good alternative for sensitive blockage of part of the cranial and cervical regions. Regional blockage of superficial branches of the cervical plexus is an effective and safe procedure, and can be used in some procedures in the estomatological ambit.

KEY WORDS: local anesthesia, cervical plexus, anesthesiology.

INTRODUCTION

Regional blockages conform a fundamental pillar in anesthesiological practice and are frequently used in diverse areas of the human body. In cervical and facial regions they gain relevance because many of the procedures that are performed there, whether diagnostic or therapeutic, are done under anesthesia.

Some surgical actions performed in the tegument innervated by superficial branches of the cervical plexus require an anesthetic blockage, whether as a single procedure or associated to sedation or general anesthesia. Usually, infiltrations of anesthetic in this region are complicated because of the great number of anatomical structures involved or because of the presence of infections in the puncture site. Perilesional infiltrations show a greater risk of dissemination of infection and frequently show an incomplete efficiency.

The cervical plexus is constituted by the ventral primary branches of the four first spinal nerves, which

further distribute in superficial or sensitive tegumentary branches and deep or motor branches. The superficial branches in their course towards the cervical tegument perforate the superficial or coating lamina of the deep fascia in a highly constant point located in relation to the posterior edge of Sternocleidomastoid (SCM) muscle, approximately one centimeter over the crossing of the external jugular vein (Rouviere & Delmas, 1999; Latarjet & Ruiz-Liard, 2004). In this point or nervous intersection of the neck, nerves converge which later distribute in the neck tegument, part of the posterior and lateral region of the head including the mandibular angle. Nervous blockage by means of infiltration of anesthetic solution around this nervous zone has allowed the performance of diagnostic tests in cervicogenic painful syndromes (Shinozaki *et al.*, 2006), the attainment of analgesia posterior to surgery in the region (Eti *et al.*, 2006); and the performance of surgical procedures such as thyroidectomy (Herbland *et al.*, 2006), carotid endarterectomy (Stoneham & Knighton,

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1999; Bayter *et al.*, 2006) and surgery of vocal folds (Suresh & Templeton, 2004). To perform the blockage, it is necessary a thorough knowledge of the morphology of the region and the relation of deepness of the injection, since the cervical fasciae are the ones that delimit subregions and form barriers that prevent the trespassing of solutions towards the depth facilitating or complicating the anesthetic action (Panditt *et al.*, 2003).

The informed evidence about the use of blockage of superficial branches of the cervical plexus technique in surgical procedures in the estomatological ambit is practically inexistent. However, its knowledge and application could be useful used alone or as a complement to general anesthesia or sedation in surgical drainage of abscesses of the perimandibular region, excision of superficial lesions, and procedures such as skin suturing in corresponding dermatomes. On the other hand, regional blockages besides allowing painless procedures, contribute in decreasing the amount of anesthetic agent necessary when general anesthesia is required and could help in the control of postoperative pain (Concha & De La Cuadra, 2006).

The purpose of this article is to describe blockage of superficial branches of the cervical plexus technique and analyze its efficacy in an isolated way, without sedation. Secondly, some anesthetic parameters are analyzed in clinical trials of the technique in a series of healthy patients.

MATERIAL AND METHOD

Patients. The individuals included in this study were ASA I, who accepted the invitation to participate, with previous explanation and understanding of the objectives of the investigation, and the risks and eventual complications of the execution of the anesthetic technique. We excluded individuals with coagulopathies, coronary cardiopathy, pediatric patients because of their difficult management, and those who had an infection in the puncture site. Also, we discarded those who were on treatment with analgesic, muscle relaxants or anxiolytics medication, because they could interfere with normal sensibility or its perception.

Technique description. With the patient in supine decubitus position and the head slightly rotated towards the contralateral side that will be anesthetized, the

following anatomical points are localized: vertex of the mastoid process, and anterior tubercle of transverse process of the sixth cervical vertebra. A line that passes between these points is tangent to the posterior edge of the SCM muscle, which can be digitally palpated by asking the patient to rotate the head towards the opposite side that will be anesthetized. The puncture site locates in the midpoint of the line mentioned before, which coincides with the level of the thyroid cartilage. In some cases it is possible to see the external jugular vein one or two centimeters approximately inferior to that point after asking the patient to exhale against resistance (Valsalva maneuver). Antisepsy of the region is performed with 10% povidone iodine solution and the site is punctured with a 30 Gauge needle connected to a carpule syringe. The injection is always subcutaneous and is done in a fan form. The first step is the puncture in the indicated point; in that moment it is necessary to aspirate to discard intravascular infiltration. In that site, a papule of anesthetic solution is slowly injected. Then, the infiltration continues upwards following the edge of the SCM muscle 1.5 centimeters approximately and finally the same way downwards (Fig. 1). An odontological use ampoule of 1.8 ml of 2% lidocaine solution plus 1/100.000 epinephrine in a dose of 36 mg was used.

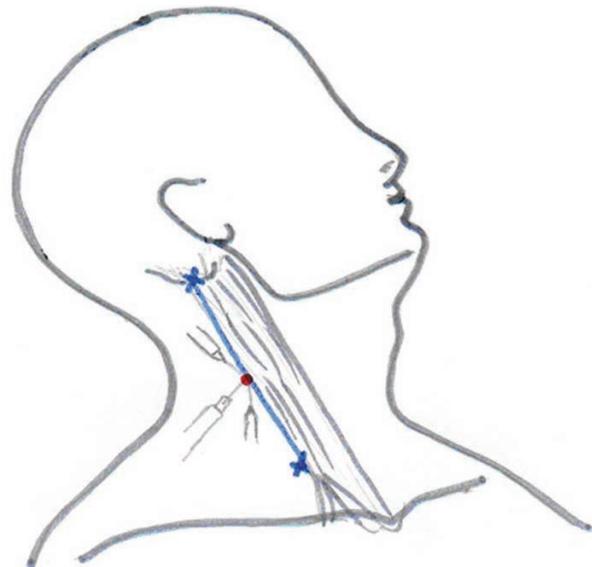


Fig. 1. Localization of parameters and direction of injection for performing blockage of superficial branches of the cervical plexus.

The moment of withdrawal of the needle is considered as time zero. The verification of anesthesia was done in five points correspondent to innervation of the different superficial branches of the cervical plexus (minor occipital, great auricular, transverse cer-

vical and supraclavicular nerves), which are depicted in Fig. 1. For such purpose, tactile tests are used as pinching of the skin with a dental tweezer, superficial pain test with a needle, and thermic test with a cold cotton impregnated with ethyl chloride. The absence of tactile, pain or thermic response in the five points is interpreted as complete anesthesia. Partial anesthesia is considered when 4 or less points are insensible. Tests are performed before the infiltration, and after the infiltration every 5 minutes over the first 30 minutes, and then at 60, 90, 120, 150 and 180 minutes. The complete time of verification was 3 hours. In addition, a follow-up was done the day after the puncture to assess any eventual postoperative complications.

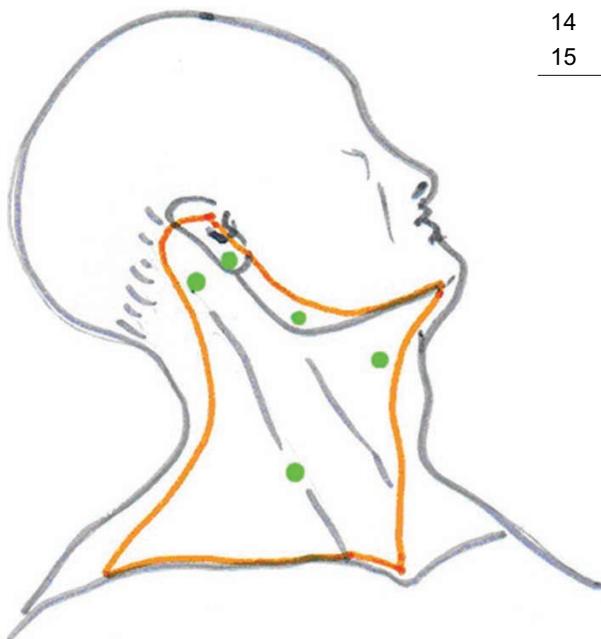


Fig. 2. In green, the verification points of anesthesia, after puncture in the nervous intersection of the neck. In orange, the perimeter of cutaneous areas innervated by the cervical plexus.

RESULTS

The anesthetic technique was applied to a group of 15 individuals, 8 men (53.3%) with a mean age of 31 years, and 7 women (46.7%) with a mean age of 29 years. The age range of the whole group was 20-49 years. The mean of age was 27 years and standard deviation 8.15.

Table I. Verification of anesthesia (X) by infiltration of the nervous point of the neck, in different periods of time.

	5'	10'	15'	20'	25'	30'	60'	90'	120'	150'	180'
1		X	X	X	X	X	X	X	X	X	X
2		X	X	X	X	X	X	X	X		
3			X	X	X	X	X	X			
4			X	X	X	X	X	X	X	X	X
5		X	X	X	X	X	X	X			
6			X	X	X	X	X	X	X		
7		X	X	X	X	X	X	X	X		
8		X	X	X	X	X	X	X	X		
9		X	X	X	X	X	X	X	X		
10			X	X	X	X	X	X	X		
11			X	X	X	X	X	X			
12		X	X	X	X	X	X	X	X	X	
13		X	X	X	X	X	X	X	X		
14		X	X	X	X	X	X	X	X		
15		X	X	X	X	X	X	X	X	X	X

There was no anesthesia at 5 minutes in any of the cases.

At 10 minutes, 10 subjects (66.7%) presented complete anesthesia, that is in the five verified points. All subjects showed anesthesia at 15 minutes. In 14 of the 15 patients anesthesia was complete, and in 1 case it was partial. In this partial case the anesthetized points were the superior ones (retroauricular tegument, ear lobe and mandibular angle). The cervical points had normal sensibility. Anesthesia was complete in follow-ups at 15, 20, 25, 30, 60 and 90 minutes.

The anesthetic effect was verified in 12 patients (80%) at 120 minutes, only 3 showed a certain degree of sensibility. At 150 minutes, 4 patients (26.7%) kept anesthesia. In the follow-up at 180 minutes, 3 patients presented anesthesia. Summary of the results is shown in Table I.

There were no accidents during the development of the technique or early complications. There was no ecchymosis, hematoma, or signs of intravascular injection in any of the cases.

The only complication was verified in the next day follow-up and corresponded to mild pain in the puncture site, which presented in all cases.

DISCUSSION

The results of the study show that blockage of superficial branches of the cervical plexus technique is an effective, efficient and safe procedure when it is applied correctly in healthy adults. It is a simple and potentially useful technique in diverse clinical scenarios, and it is executed applying the knowledge of regional anatomy, both of the nerves that will be anesthetized and the structures that will be infiltrated. Injection of the anesthetic solution is performed in the sternocleidomastoid region, which presents important elements to know and recognize in clinical practice. In this sense, it is valuable to understand the distribution of cervical fasciae. On one hand, the superficial fascia that surrounds the cervical circumference, and on the other hand, the complex deep fascia, with its three laminae and compartments that they limit. Pandit et al. demonstrated that the coating lamina of the deep fascia constitutes an effective barrier that prevents trespassing of solutions from the surface to the depth, therefore a subcutaneous injection, superficial to this lamina, has a lower or null risk of trespassing towards deep spaces, thus eliminating the possibility of anesthesia of deep nerves, such as the phrenic nerve, and eliminating the possibility of diaphragmatic hemiparesis and respiratory difficulty as a complication.

Another element to consider is the amount of adipose panicle existent in the puncture site. The more amount of fat there is, the amount of anesthetic solution necessary to block nervous conduction will also be more, because there will be more absorption and diffusion of the drug. We believe that the partial failure shown in one case of our test series is attributable to that situation. Extrapolating to clinics, it is possible that in some cases it may be necessary a greater amount of anesthetic agent than used in this series.

The only complication associated to the execution of the technique in patients of our series was postoperative pain in the puncture site. Probably due to laceration of superficial tissues of the neck by the injection of an aqueous solution that disseminates slowly, and possibly it would be diminished with a smaller amount of anesthetic solution.

The relatively brief latency time and the utilization of inputs and instruments of frequent use

in the dental clinic allow to maximize available resources, including clinical time for a procedure. The essayed technique showed to be efficient in the great majority of the cases, and provides at least 90 minutes for clinical work, enough time for most of the surgical procedures that are performed in an ambulatory form.

There is discrepancy between the diverse authors regarding the type and amount of anesthetic drug used for similar techniques, Herebland et al. used 10 ml of 0.75% Ropivacaine, Suresh & Templeton used 4 ml of 0.25% Bupivacaine with 1:200.000 epinephrine, Stoneham & Knighton used 20 ml of 0.375% Bupivacaine, Gallardo (2006) used 5 to 10 ml of 1.5% Lidocaine or 0.5% Bupivacaine. The volume and amount of drug used in our test series was less than all those informed in the literature (2% Lidocaine, in 1.8 ml). On the other hand, the use of associated vasoconstrictor (1:100.000 Epinephrine) increases the potency and duration of anesthesia and decreases the possibility of diffusion of the anesthetic, contributing to reduce the risks of toxicity (Concha & De La Cuadra).

The described technique appears as an interesting alternative to perilesionar infiltrations for drainage of abscesses of perimandibular regions. In such cases, blockage of superficial branches of the cervical plexus would be efficient by itself or with sedation, always indicated if there is no involvement of the airway or any other condition that would contraindicate the procedure under regional anesthesia in an ambulatory surgical room. If there are major involvements and the patient requires to be intubated for management of the airway and general anesthesia, regional blockage could improve the anesthetic parameters and could decrease the requirement of general anesthetics (Concha & De La Cuadra). It could also be an alternative in other surgical procedures such as excision of cutaneous tumors and nevus, and trauma wound suturing.

Finally, we believe it is important to highlight that the technique described and tested in our study has precise indications and contraindications in the estomatological ambit, initial psychological and physical assessment of the patient is primordial for good clinical success, and as in all invasive procedures, safety norms must be extremed to diminish the associated risks.

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RESUMEN: La anestesia regional provee gran utilidad en los territorios facial y cervical, y es la base que permite la realización de diversos procedimientos quirúrgicos y pruebas diagnósticas. Parte importante del tegumento craneal y cervical es inervado por ramos superficiales del plexo cervical, los que pueden ser bloqueados mediante la infiltración de anestésico en un único punto ubicable en la región lateral del cuello. Se ejecutó una técnica anestésica para bloqueo de los ramos tegumentarios del plexo cervical en una serie de prueba constituida por 15 adultos sanos. La anestesia se comprobó por medio de pruebas táctiles, de dolor y de temperatura, en cinco puntos sobre los dermatomas del plexo cervical. Se verificó anestesia completa en 14 de los 15 pacientes. En la totalidad de los casos la duración anestésica fue al menos de 90 minutos, y no hubo accidentes ni complicaciones mayores asociadas a la ejecución de la técnica. El efecto anestésico notable y el tiempo de trabajo adecuado, sumado al bajo riesgo de accidentes y complicaciones, hacen de esta técnica una buena alternativa para el bloqueo sensitivo de parte de las regiones craneal y cervical. El bloqueo regional de ramos superficiales del plexo cervical es un procedimiento eficaz y seguro, y podría ser utilizado en algunos procedimientos del ámbito estomatológico.

PALABRAS CLAVE: anestesia local, plexo cervical, anestesiología.

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