



## Case Series

## Locoregional anesthesia for removal osteosynthesis hardware from healed corpus mandibularis fractures: A descriptive study of a series of 40 cases

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## ABSTRACT

**Introduction:** Locoregional anesthesia represents a very interesting modality for the removal of osteosynthesis hardware of the corpus mandibularis. Several procedures have been described, but each is dedicated to a single mandibular segment.

**Material and methods:** The surgical records of 40 patients treated with rigid internal fixation after maxillofacial traumas were reviewed. Study variables included age, sex, site and number of plates, time of plate removal, reasons for plate removal, and postoperative.

**Results:** Our study enrolled 40 patients, 45% of whom had single-focal plate placement and 55% of whom had bifocal plate placement. 66% of the patients with bifocal plate placement had the plates removed during the same operation. The average operative time was 45 min for bifocal and 28 min for single-focal approaches. Postoperative complications were observed only for the truncal analgesia procedure of the inferior alveolar nerve at the mandibular foramen. Anesthesia failure was reported in 2 patients.

**Discussion:** Various locoregional anesthetic procedures are used to remove mandibular body plates but each has its indication depending on the mandibular segment being treated. Factors that can lead to failure of locoregional anesthesia are dominated by the state of inflammation at the site and patient anxiety which can be minimized by premedication with anxiolytics.

**Conclusion:** Locoregional anesthesia for removal of osteosynthesis hardware of the corpus mandibularis remains a good anesthetic method that is performed in good conditions when it is done in compliance with standards. Its use avoids the usual risks and complications that can occur under general anesthesia.

### 1. Introduction

In oral and maxillofacial surgery, the use of local anesthesia allows many surgical procedures to be performed painlessly [1]. Their use is safe when the procedure is correctly applied [1]. The removal of mandibular osteosynthesis hardware remains one of the surgical techniques rarely performed under local anesthesia due to the numerous failure factors that may be present. The aim of our paper is to share our experience in the removal of mandibular osteosynthesis hardware under locoregional anesthesia.

### 2. Patients and methods

Our study focuses on patients undergoing surgery for removal of mandibular body osteosynthesis material under locoregional anesthesia during the period from January 1, 2020 to January 31, 2021.

Inclusion criteria:

- Age between 18 and 50 years
- Osteosynthesis plates in the corpus mandibularis
- Time between osteosynthesis of mandibular fracture(s) and removal of osteosynthesis plates between 6 months and 1.5 years

Exclusion criteria:

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- Age < 18 years or > 50 years
- Osteosynthesis plates outside the mandibular body
- Delay between osteosynthesis of mandibular fracture(s) and removal of osteosynthesis plates greater than 1.5 years

The anesthetic drug used is lidocaine 2% for truncal analgesia of the inferior alveolar nerve at the mandibular foramen and the chin foramen, and the combination of lidocaine 2% and epinephrine for local infiltration (the cumulative dose was between 100 and 200 mg).

The local anesthetic technique used was chosen according to the location of the osteosynthesis plates:

- Truncal analgesia of the inferior alveolar nerve at the mandibular foramen for the removal of the osteosynthesis material at the angular level
- Truncal analgesia of the inferior alveolar nerve at the mandibular foramen + local infiltration for the removal of osteosynthesis material at the horizontal branch
- Truncal analgesia of the inferior alveolar nerve at the chin foramen + local infiltration for the removal of osteosynthesis material at the parasymphiseal level
- Local infiltration for removal of osteosynthesis material at symphyseal level

Patients with an anxiety profile were premedicated with anxiolytics (benzodiazepine/hydroxyzine).

This case series has been reported in line with the PROCESS criteria [13].

### 3. Results

40 patients underwent removal of mandibular body osteosynthesis hardware during the study period. 92.5% of the patients were male versus 7.5% female. The average age of the patients was 25.5 years. The indication for removal of osteosynthesis material was dominated by local discomfort and pain in 75% of cases, followed by plate exposure in 17.5% of cases and infection in the remaining cases.

The location of the plates was bifocal in 45% of the patients and single-focal in the rest. 2/3 of the patients with a bifocal location of the plates had the plates removed in the same operation. In patients with a single-focal plate location, the location was symphyseal in 45.4% of cases, parasymphiseal in 27.3% of cases, at the level of the horizontal branch in 9% of cases and angular in 18.3% of cases. Among patients with a bifocal location of the osteosynthesis plates, the location of the osteosynthesis plates was at the parasymphiseal and angular level in 83.3% of cases, at the horizontal and angular level in 11% of cases and at the bilateral angular level in the other cases [Table 1].

The average operating time was 28 min for monofocal and 45 min for bifocal approaches.

Regarding postoperative complications, 16.7% of patients who received truncal analgesia of the inferior alveolar nerve at the mandibular foramen had chronic pain at the injection site, no cases of hematoma of the masseter or medial pterygoid muscles were observed, 11% of the patients had trismus postoperatively which was managed by rehabilitation of the manducatory system. No complications were

**Table 1**  
Distribution of patients by placement and site of fixation plates.

Location of osteosynthesis plates	Site of osteosynthesis plates	%
Single-focal	Symphiseal	45,5
	Parasyphysial	27,3
	Horizontal branch	9
	Angular	18,3
Bifocal	Parasyphysial + Angular	83,3
	Horizontal branch + Angular	11
	Bilateral angular	5,7

observed for the other techniques of locoregional anesthesia used in our study [Table 2].

Failure of local anesthesia was recorded in 2 cases, 1 was due to inflammation of the surgical site and the other was due to anxiety that could not be managed at the time of surgery.

### 4. Discussion

Removal of rigid internal fixation of the corpus mandibularis can be indicated in many situations, the indications are mainly dominated by infection, dehiscence of surgical access, exposure of the material, subjective discomfort and in angular osteosynthesis, especially mid-flat with a single plate [2,3,14].

There is several locoregional anesthesia procedures for the removal of osteosynthesis material from the corpus mandibularis. These techniques are a good alternative to general anesthesia in terms of avoiding the risks and complications of general anesthesia and reducing the rate of hospitalisation.

The infiltration anesthesia approach is applicable in the removal of osteosynthesis plates at the symphyseal level due to the multiple drawbacks of other methods in this region [1,9]. Truncal analgesia of the inferior alveolar nerve at the mandibular foramen or the chin foramen does not provide any cross-supply to the contralateral territories unless bilateral injections are given [9]. The infiltration method is only partially suitable for the posterior regions of the mandible as the cortex osseous bone is much less permeable, resulting in insufficient diffusion of the anesthetic through the bone [1,9,11]. This method of anesthesia can also be used in addition to other techniques to overcome anesthetic failure caused by accessory nerve supply [9].

Truncal analgesia of the inferior alveolar nerve at the mandibular foramen is the most commonly used technique for unilateral mandibular body anesthesia [11]. It is very reliable when performed correctly [1]. It is the only local anesthetic technique that allows long and multiple procedures to be performed on the mandible with total operative comfort [11]. It should always be performed as a first-line procedure for the removal of osteosynthesis plates from the mandibular body outside the symphyseal region and supplemented by other techniques if necessary [1,9,11]. Complications that may be encountered following this anesthetic technique are trauma to the inferior alveolar or lingual nerve by the needle causing temporary or permanent damage to these nerves, hematoma or hemorrhage at the puncture site due to breach of local vessel walls, trismus due to edema or hematomas of the masseter and/or medial pterygoid muscles following their trauma [5,11].

Truncal analgesia of the inferior alveolar nerve at the chin foramen allows mandibular anesthesia opposite the homolateral incisivo-canine and premolar block [11]. This efficient and easy to perform technique allows the removal of the osteosynthesis plates located in the corresponding territory [11]. The complication that may be encountered following this anesthetic technique is trauma to the chin nerve [5].

The most commonly used anesthetic in practice is lidocaine, which has a recommended cumulative dose of between 100 and 200 mg in

**Table 2**  
Distribution of patients according to postoperative complications per-type of locoregional anesthesia procedure.

Type of local anesthesia technique	Complication	%
Truncal analgesia of the inferior alveolar nerve at the mandibular foramen	No complication	72,3
	Chronic pain at puncture site	16,7
	Trismus	11
	Hematoma of the masseter or medial pterygoid muscle	0
Truncal analgesia of the inferior alveolar nerve at the chin foramen	Paraesthesia of the inferior alveolar nerve	0
	No complication	100
Analgesia by local infiltration	No complication	100

adults [8,11]. The anesthetic effect is established in two to 5 min and its average duration of action is one and a half hours [8,11]. This duration of action can be increased by combining it with a vasoconstrictor agent (epinephrine, norepinephrine, etc.), this combination also allows the systemic passage of the anesthetic product to be reduced as well as intraoperative bleeding [6,10,11].

Mandibular local anesthesia is complex because it depends on several factors that can contribute to its failure [4,11]. These factors may be related to the patient, failure being more noticeable in female patients and anxious patients, the local condition of the surgical site, the presence of inflammation decreases the stimulation threshold of the nerve fibers which decreases the efficacy of the anesthetic product, the use of an analgesic technique unsuited to the mandibular segment approached, the administration of a low dose of the anesthetic product or the exceeding of its efficacy time [4,7,11]. The operating time may be increased in the case of removal of mandibular osteosynthesis material if the latter is osseointegrated, requiring milling around the plates to remove them.

Pre-medication with anxiolytics is justified in female patients or those with an anxious profile before removal of osteosynthesis material under local anesthesia and can be considered the day before the operation. The main anxiolytic drugs used for premedication are benzodiazepines and hydroxyzine, which help to avoid anxiety in patients before and during the operation and to improve comfort afterward [12].

## 5. Conclusion

Local anesthesia remains very interesting for the removal of osteosynthesis hardware of the corpus mandibularis, it allows the achievement of the intervention with total operative comfort when it is well-practiced, and it also allows avoiding the risks and complications of general anesthesia. Post-operative complications remain limited and method-dependent and the factors of failure must be sought and taken into account before the accomplishment of the intervention to well pose the indication of this anesthetic approach and to avoid a bad experience for the patient.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.102619>.

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## Author contribution

Rachid Aloua: writing the paper  
Ousmane Belem: Corresponding author writing the paper  
Ouassime kerdoud: writing the paper  
Faïçal Slimani: Correction of the paper

## Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

## Registration of research studies

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## Guarantor

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## References

- [1] S. Jan, Schenkel, Matthias Mottini, Claudio Rostetter, Martina Schriber, Heinz-Theo Lübbers. Les possibilités d'anesthésie locale dans le maxillaire inférieur, *Swiss Dent. J. SSO* 129 (7/8) (2019).
- [2] H. Thorén, J. Snäll, E. Kormi, C. Lindqvist, L. Suominen-Taipale, J. Törnwall, Symptomatic plate removal after treatment of facial fractures, *J. Cranio-Maxillo-Fac. Surg.* 38 (7) (2010) 505–510, <https://doi.org/10.1016/j.jcms.2010.01.005>. Epub 2010 Mar 2. PMID: 20199870.
- [3] H. Thorén, J. Snäll, W. Hallermann, E. Kormi, J. Törnwall, Policy of routine titanium miniplate removal after maxillofacial trauma, *J. Oral Maxillofac. Surg.* 66 (9) (2008) 1901–1904, <https://doi.org/10.1016/j.joms.2008.03.009>. PMID: 18718398.
- [4] R. Bengono Bengono, C. Bengondo, et al., Analgésie en Odontostomatologie : stratégies contre les échecs d'Anesthésie Locorégionale, *Health Sci. Dis.* 16 (2) (2015). April - May - June.
- [5] L'anesthésie locale dentaire avec vasoconstricteur, *Rev Prescrire.* mai 23 (239) (2003) 371–376. Tome.
- [6] Yu-Hao Wang, Dian-Ri Wang, Ji-Yuan Liu, Jian Pan, Local anesthesia in oral and maxillofacial surgery: a review of current opinion, *J. Dent. Sci.* (2020), <https://doi.org/10.1016/j.jds.2020.12.003>, 1991–7902.
- [7] David R. Cummings, Dennis-Duke R. Yamashita, James P. McAndrews, Complications of Local Anesthesia Used in Oral and Maxillofacial Surgery, *Oral Maxillofac. Surg. Clin.* 23 (Issue 3) (2011) 369–377, <https://doi.org/10.1016/j.coms.2011.04.009>, 1042–3699.
- [8] H. Beloeil, J.-X. Mazoit, *Pharmacologie des anesthésiques locaux*. EMC, Elsevier Masson SAS, Paris, 2010, pp. 36–320. *Anesthésie-Réanimation*, A-10.
- [9] J.G. Meechan, The use of the mandibular infiltration anesthetic technique in adults, *J. Am. Dent. Assoc.* 142 (Suppl 3) (2011) 19S–24S, <https://doi.org/10.14219/jada.archive.2011.0343>. PMID: 21881058.
- [10] C. Madrid, B. Courtois, M. Vironneau, et al., Emploi des vasoconstricteurs en odonto-stomatologie, *Med Buccale Chir Buccale* 9 (2003) 65–94.
- [11] L'analgésie mandibulaire en odontostomatologie : Stratégie contre les échecs d'anesthésie, *Sciences du Vivant [q-bio]*, 2010 hal-01739116.
- [12] M. Raucoules-Aim, M. Bousofara, *Médicaments de la prémédication*, EMC - Anesthésie-Réanimation 36 (2013) 375. A-20.
- [13] R.A. Agha, C. Sohrabi, G. Mathew, T. Franchi, A. Kerwan, O'Neill N for the Process Group, The PROCESS 2020 guideline: updating consensus preferred reporting of CasE series in surgery (PROCESS) guidelines, *Int. J. Surg.* 84 (2020) 231–235.
- [14] Ouassime Kerdoud, Rachid Aloua, Amine kaouani, Faïçal Slimani, Management of mandibular angle fractures through single and two mini-plate fixation systems: retrospective study of 112 cases, *Int. J. Surg. Case Rep.* 80 (2021) 105690, <https://doi.org/10.1016/j.ijscr.2021.105690>, 2210–2612.