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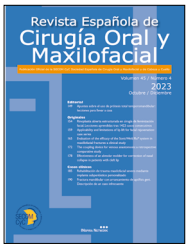

**Original**

# Mandibular fracture with geni process avulsion. Description of an uncommon case

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ABSTRACT

*The geni processes are projections present on the lingual surface of the mandibular symphysis. Fracture and complete separation of them from the mandibular remnant is rare and although it is not frequently associated with striking symptoms, it can be a life-threatening condition, therefore, it is necessary to know in which cases a specific treatment should be considered.*

## Fractura mandibular con arrancamiento de apófisis geni. Descripción de un caso infrecuente

*Palabras clave:*

Mandíbula, fractura, apófisis geni, tubérculos geni.

RESUMEN

Las apófisis geni son proyecciones presentes en la cara lingual de la sínfisis mandibular. La fractura y separación completa de las mismas del remanente mandibular es infrecuente y, aunque no suele asociar clínica llamativa, puede llegar a suponer un compromiso vital, por lo que es necesario conocer en qué casos se debe plantear un tratamiento específico.

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## INTRODUCTION

The geni tubercles are projections on the lingual side of the mandibular symphysis, which lie between the upper and lower border of the mandible[1,2].

Fracture of these apophysis is very rare, with less than 35 cases reported in literature, and can occur spontaneously or in association with trauma[1]; it can be a simple avulsion of the apophysis or a separation of the lingual cortex including them[3].

The treatment of geni tubercle fractures is controversial and, since it is an infrequent finding, difficult to study[4].

Most of the reported cases deal with isolated fractures in elderly patients in the absence of a clear traumatic history and with conservative management of the fracture.

## CLINICAL CASE

We present the case of a 38-year-old woman who came to the emergency department after suffering facial trauma.

Examination revealed a submental hematoma, a step between the lower central incisors and a sublingual hematoma associated with dysphagia without clear dyspnea and with stable vitals.

Orthopantomography (OPG) shows a single symphyseal fracture trace.

Computed axial tomography (CT) shows a mandibular symphyseal fracture line with the avulsion of a bone fragment of triangular morphology on the lingual side, corresponding to the geni tubercles (Figure 1 and 2).

Surgical treatment was decided by reduction of the fracture site and osteosynthesis with mini-plates. Given the complete avulsion of the geni apophysis, wire cerclage of the lingual fragment that included them with the muscle insertions was performed (Figure 3), achieving an anatomical reduction.

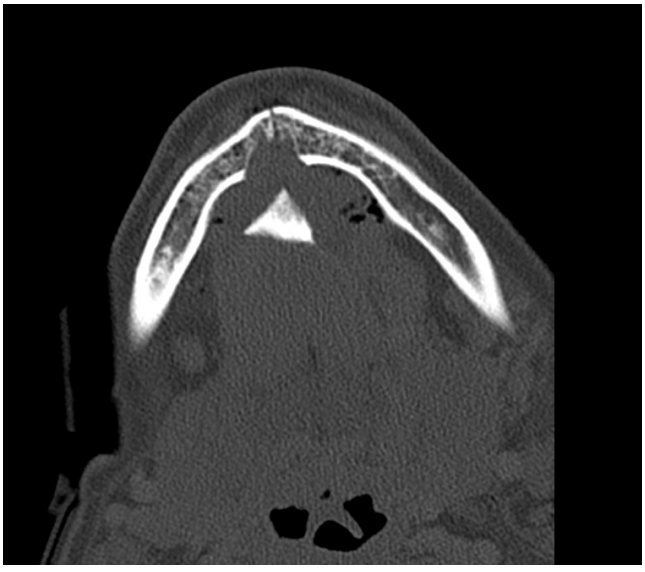

**Figure 1. CT image showing the symphyseal fracture with posterior displacement of the geniculate processes. Axial view.**

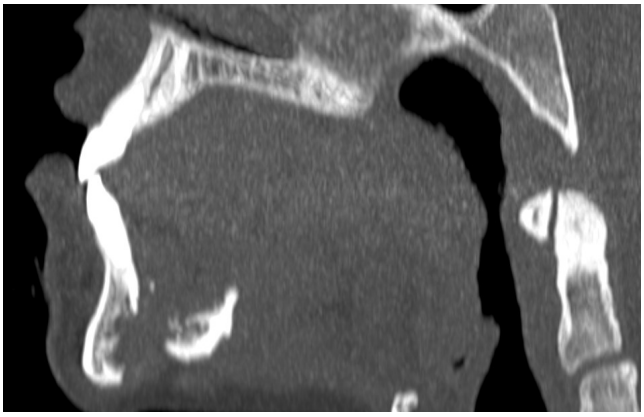

**Figure 2. CT image showing the symphyseal fracture with posterior displacement of the geniculate processes. Sagittal view.**

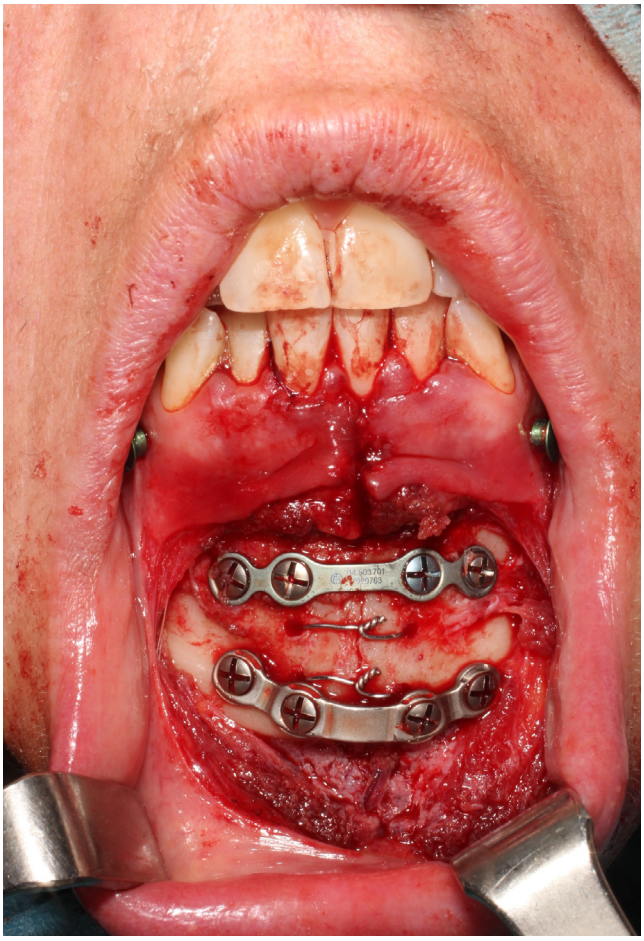

**Figure 3. Surgical treatment.**

During the postoperative period, the patient reported an evident improvement in swallowing. A control CT scan was performed, in which, in addition to a correct reduction of the bone fragments, a widening of the airway was observed with respect to the pre-surgical CT scan (Figure 4). The patient was discharged without complications. In the outpatient follow-up, a progressive resolution of both intra- and extra-oral hematomas and adequate occlusion was observed.

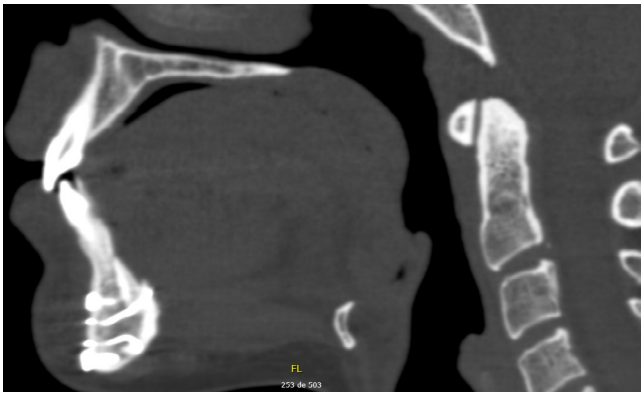

**Figure 4. Postoperative control CT scan, showing the widening of the airway after repositioning of the geni tubercles. Sagittal view.**

## DISCUSSION

The genioglossus and geniohyoid muscles that insert into the geni tubercles contribute

to the buccal and pharyngeal phases of swallowing[4].

Fracture of these apophysis can occur spontaneously or in association with trauma; it can be solely an avulsion of the apophysis or a separation of the lingual cortex including them[3]; and it can occur in isolation, without being associated with other fractures[1].

In 1894 Gwilym G. Davis reported the first case of mandibular fracture with pullout of the genial processes[1], and subsequently 32 more cases have been described (Table 1), of which 20 are spontaneous fractures and the rest are associated with trauma, such as the case reported in this article.

Table I. Summary of cases reported in the literature of geni process fractures.

| Author | Year | Age (years) | Gender | Type | Symptoms | Radiology | Treatment | Recovery |
|---|---|---|---|---|---|---|---|---|
| Davis[5] | 1894 | 26 | Male | Traumatic | Submental injury, dyspnea | | Geni tubercle repositioning | Complete |
| Smyd[6] | 1957 | | Male | Spontaneous | | | Conservative | Partial, difficulty in tongue mobility |
| Reifman[7] | 1969 | 70 | Woman | Spontaneous | Pain, edema, cracking | Occlusal radiography | Bone fragment removal and muscle repositioning | Complete |
| Maw et al.[8] | 1970 | 18-21 | Male | Traumatic | | Occlusal radiography | Conservative | Complete |
| Maw et al.[8] | 1970 | 18-21 | Male | Traumatic | | Occlusal radiography | Conservative | Complete |
| Maw et al.[8] | 1970 | 18-21 | Male | Traumatic | | Occlusal radiography | Conservative | Complete |
| Maw et al.[8] | 1970 | 18-21 | Male | Traumatic | | Occlusal radiography | Conservative | Complete |
| Maw et al.[8] | 1970 | 18-21 | Male | Traumatic | | Occlusal radiography | Conservative | Complete |
| Shipman[9] | 1976 | 73 | Woman | Spontaneous | Pain, cracking | | Bone fragment removal and muscle repositioning | Complete |
| Glendinning et al.[10] | 1977 | 46 | Woman | Spontaneous | Severe pain, edema, cracking | Occlusal radiography | Conservative | Complete |
| Glendinning et al.[10] | 1977 | 77 | Woman | Spontaneous | None | Occlusal radiography | Conservative | Complete |
| Goebel[11] | 1978 | 65 | Male | Spontaneous | Severe pain | Occlusal radiography | Conservative | Complete |
| Carroll[12] | 1983 | | Woman | Spontaneous | Pain, edema, dysphagia | | | Complete |
| Youngs et al.[13] | 1984 | 77 | Male | Spontaneous | Severe pain, edema, dysphagia | Occlusal radiography | Bone fragment removal | Complete |
| Santos-Oller et al.[14] | 1992 | 68 | Woman | Spontaneous | Pain, edema | Occlusal radiography | Bone fragment removal and muscle repositioning | Complete |
| Burnett et al.[15] | 1993 | | Woman | Spontaneous | | | | Complete |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Shohat et al.[16] | 2003 | 70 | Woman | Spontaneous | Pain, sublingual hematoma, cracking | Occlusal radiography | Conservative | Complete |
| Yassutaka et al.[17] | 2006 | 63 | Woman | Spontaneous | | Occlusal radiography | | Complete |
| Gallego et al.[2] | 2007 | 86 | Woman | Spontaneous | Pain, sublingual and submental hematoma, dysphagia, cervical ecchymosis, difficulty speaking | CT | Conservative | Complete |
| Ryan et al.[18] | 2010 | 22 | Male | Traumatic | Sublingual hematoma, dyspnea | CT | Geni tubercle repositioning | |
| Redeling-huys et al.[19] | 2011 | 74 | Woman | Spontaneous | Severe pain, sublingual hematoma, cracking | CT | Conservative | Complete |
| Yuen[20] | 2011 | 68 | Woman | Spontaneous | Pain, sublingual hematoma, dysphagia | Occlusal radiography | Conservative | Complete |
| Burnett et al.[21] | 2012 | 62 | Woman | Spontaneous | Pain, sublingual edema, cracking, dysphagia | Occlusal radiography | Conservative | Complete |
| Elshal[22] | 2012 | 28 | Male | Traumatic | Pain, edema, difficulty speaking | CT | Geni tubercle repositioning | Complete |
| Van Leeuwen et al.[23] | 2014 | 80 | Woman | Spontaneous | Pain, sublingual hematoma, cracking, dysphagia | CT | Conservador | Complete |
| Freeman et al.[24] | 2014 | 68 | Woman | Spontaneous | Pain, sublingual edema | Occlusal radiography | Conservative | Complete |
| Bacci et al.[25] | 2015 | 87 | Woman | Spontaneous | Pain, sublingual hematoma, cervical ecchymosis, dysphagia | CT | Conservative | Complete |
| Buduru et al.[26] | 2015 | 52 | Male | Traumatic | Pain, submental hematoma, malocclusion | Occlusal radiography | Reduction of other associated fractures, leaving the geni tubercle intact | Complete |
| Wan et al.[27] | 2017 | 85 | Male | Spontaneous | Pain, sublingual hematoma | Occlusal radiography | Conservador | Complete |
| Sasaki et al.28 | 2019 | 34 | Male | Traumatic | Intraoral bleeding | TAC | Geni tubercle repositioning | Complete |
| Cillo et al.[4] | 2021 | 70 | Male | Traumatic | Pain, sublingual hematoma, malocclu-sion, dysphagia, dyspnea | CT | Geni tubercle repositioning | Complete |
| Cillo et al.[4] | 2021 | 17 | Male | Traumatic | Sublingual hematoma, dysphagia, malocclusion | CT | Geni tubercle repositioning | Complete |
| Albassal et al.[3] | 2021 | 22 | Male | Traumatic | Pain, edema sublingual ecchymosis | CT | Reduction of other associated fractures, leaving the geni tubercle intact | Complete |
| Montoro et al.[29] | 2024 | 38 | Woman | Traumatic | Submental hematoma, sublingual hematoma, step, dysphagia | CT | Geni tubercle repositioning | Complete |

The age of the patients can vary from the second decade of life to the eighth, however it is more frequent in the population over 61 years of age and in women, this population is subject to it more than the others due to spontaneous fracture. However, if the fracture is associated with trauma, the patient is usually male[1].

To adequately describe this type of fracture, Sasaki et al. and Cillo et al. divide them into two different groups: mandibular fracture with geniculate process avulsion type I, or spontaneous; and mandibular fracture with geniculate process avulsion type II, or associated with facial trauma.

In the first group the predisposing factors, especially in women, are mandibular atrophy, osteoporosis or poorly fitting dentures[1,27], the geni tubercles become more prominent with advanced mandibular atrophy and calcification of the genioglossus and geniohyoid muscles, this makes them more susceptible to trauma due to lower dentures that cause microfractures at this location, and the tension caused by these muscles could separate the apophysis of the mandibular body[3,23,27].

Among the clinical symptoms reported in these cases, the most frequent is a “cracking” sensation, followed by pain[1].

In the case of mandibular fracture with dislodging of the geniculate process associated with facial trauma, mandibu-

lar fractures frequently occur in the context of facial trauma, generally these do not pose a vital risk, however some types of facial fractures, which are infrequent[3], can lead to compromised airways[30], as in the case of posterior displacement of the mandibular lingual cortex at the level of the symphysis[30,31], where due to the loss of bony continuity, the inserted musculature has a tendency to move inferiorly and posteriorly this segment, and the muscular support that maintains the tongue and hyoid in their anatomical position is lost[32].

In terms of the clinical manifestations, common to both types of fracture, related to this process are edema, ecchymosis, sublingual or extraoral hematoma, and especially crepitation associated with pain, limited lingual mobility and dysphagia[1,2].

Among the imaging tests frequently performed are OPG, which due to the orientation and overlapping of structures does not allow visualization of the geni tubercles; Cone Beam Computed Tomography (CBCT) and Computerized Axial Tomography (CT), which allows accurate assessment of the degree of displacement and dimension of the airway, exclude other possible diagnoses, and establish the most appropriate treatment for the patient[1,27].

Treatment is controversial[2].

A large majority of authors advocate conservative management, which is the most frequently applied in literature[1,2], especially in type I fractures. In this type of patient, airway compromise is rare, as the fracture occurs in the context of normal masticatory forces[4]. There are 3 factors postulated by Maw and Lindsay that justify correct lingual function despite such a fracture: the ability of the intrinsic muscles to modify the shape of the tongue and to slightly protrude it, the action of the palatoglossus muscle which can elevate and displace the tongue anteriorly and finally the formation of fibrous attachments between the fibers of the genioglossus muscles with the tissue of the floor of the mouth[4,8], as well as the presence of insertions of this muscle in the lingual cortex beyond the genioglossus processes[3]; which over time may lead to partial resolution of the injury with increased muscle attachments to the lingual cortex and even anterior displacement of the fractured fragment[3,4].

The other option is surgical treatment, when an open reduction of other associated fractures at mandibular level is to be performed, when it generates great discomfort for the patient, for the prevention of inflammation and pain associated with fibrous hyperplasia that develops in the tissues surrounding the processes[1]; and the most important cause is airway obstruction[30,31], due to the genioglossus muscles losing the ability to protrude the tongue, endangering the upper airway[30]. In addition, inflammation and edema associated with trauma increase this risk[4].

Surgical treatment was used in 12 cases, either to treat the geni tubercle fracture or the associated mandibular fracture or to remove the bone fragment, and only in 5 cases the same decision as for our patient was taken, repositioning the avulsed bone fragment with the muscle insertions included.

We performed a reduction and osteosynthesis of the associated fracture and a repositioning of the geni tubercles with their muscular insertions[1], as described by Cillo et al., by fenestration in the avulsed fragment and in the mandible, and by performing an alambic cerclage to reposition the fragment in its original location[4].

## CONCLUSIONS

Although there is no defined protocol or consensus in literature on the indicated treatment for geniculate process fractures, it is important to identify them, especially in patients with a history of trauma, as the airway may be compromised. In these cases, once the airway has been secured, the avulsed fragment must be surgically repositioned. In cases where the patient does not present such a compromise, repositioning is elective.

## ETHICAL ASPECTS

The authors confirm that they have complied with the relevant ethical standards and that they have the informed consent of the patients.

## CONFLICTS OF INTEREST

There are no conflicts of interest.

## FINANCING

None.

## REFERENCES

1. Ferreira Barbosa DA, Marinho Bezerra TM, Barros Silva PG, Menezes Pimenta AV, Kurita LM, Gurgel Costa FW. Clinical, imaging, and therapeutic aspects of genial tubercle fractures: A systematic review. J Oral Maxillofac Surg. 2019;77(8):1674.e1-1674.e13. DOI: 10.1016/j.joms.2019.03.030.
2. Gallego L, Junquera L, Villarreal P, de Vicente JC. Spontaneous fracture of the mandibular genial tubercles. A case report. Med Oral Patol Oral Cir Bucal. 2007;12(8):E599-601.
3. Albassal A, Al-Khanati NM, Harfouch M. Traumatic genial tubercle fracture: a case description with 9-month radiographic follow-up and a literature analysis. Quant Imaging Med Surg. 2022;12(4):2579-85. DOI: 10.21037/qims-21-736.
4. Cillo JE Jr, Dalton PS. Traumatic genial tubercle fractures of the mandible: Airway concerns and invasive management-A report of 2 cases. J Oral Maxillofac Surg. 2021;79(7):1529.e1-1529.e8. DOI: 10.1016/j.joms.2021.02.021.
5. Davis GG. III. Fracture of the lower jaw with separation of the genial tubercle. Ann Surg. 1894;19(6):653-7. DOI: 10.1097/00000658-189401000-00068.
6. Smyd ES. Fracture of the genial tubercles. J Am Dent Assoc. 1967;55:136.
7. Reifman S. Genial tubercle fracture. Oral Surg Oral Med Oral Pathol. 1969;27(5):595-7. DOI: 10.1016/0030-4220(69)90089-9.
8. Maw RB, Lindsay JS. Conservative management of genial tubercle fractures. Oral Surg Oral Med Oral Pathol. 1970;30(4):445-9. DOI: 10.1016/0030-4220(70)90155-6.
9. Shipman B. Genial tubercle fracture: a case. Va Dent J. 1976; 53 (3) : 7-8.
10. Glendinning DEH, Hirschmann PN. Fractures of the genial tubercles: Two cases and a review of the literature. Br J Oral Surg. 1977;14(3):217-9. DOI: 10.1016/0007-117X(77)90026-9.
11. Goebel WM. Fractured genial tubercles. J Prosthet Dent. 1978;39(6):603-4. DOI: 10.1016/S0022-3913(78)80067-5.

12. Carroll MJ. Spontaneous fracture of the genial tubercles. Br Dent J. 1983;154(2):47-8. DOI: 10.1038/sj.bdj.4804987.
13. Youngs R, Albert D. Fractured genial tubercles. J Laryngol Otol. 1984;98(10):1047-8. DOI: 10.1017/S0022215100147978.
14. Santos-Oller JM, Gutierrez LMJ, De Vicente Rodriguez JC, Pendas SL. Spontaneous fracture of hypertrophied genial tubercles. Oral Surg Oral Med Oral Pathol. 1992;74(1):28-9. DOI: 10.1016/0030-4220(92)90210-H.
15. Burnett CA, Clifford TJ. A case of fractured genial tubercles. Dent Update. 1993;20(5):219.
16. Shohat I, Shoshani Y, Taicher S. Fracture of the genial tubercles associated with a mandibular denture: A clinical report. J Prosthet Dent. 2003;89(3):232-3. DOI: 10.1067/mpr.2003.46.
17. Yassutaka Faria Yaedú R, Regina Fisher Rubira-Bullen I, Sant'Ana E. Spontaneous fracture of genial tubercles: case report. Quintessence Int. 2006;37(9):737-9.
18. Ryan JM, Ross D, Obeid G. Genial tubercle fracture: A case report and review of the literature. J Oral Maxillofac Surg. 2010;68(9):2338-41. DOI: 10.1016/j.joms.2010.02.032.
19. Redelinghuys IF, Holtshousen WSJ. Fracture of the genial tubercles associated with a mandibular denture: a clinical report and review of the literature. SADJ. 2011;66(5):230-3.
20. Yuen KM. Isolated fracture of the genial tubercles: Report of a case. Asian J Oral Maxillofac Surg. 2011;23(4):210-2. DOI: 10.1016/j.ajoms.2011.06.004.
21. Burnett PJ, Nixon PP, Rogers SN. Spontaneous fracture of the genial tubercles: a case report. Dent Update. 2012;39(1):63-4. DOI: 10.12968/denu.2012.39.1.63.
22. Elshal E. Surgical management of fracture of unilateral genial tubercles. Rev Cir Traumatol Bucomaxilofac. 2012,12:17.
23. van Leeuwen AC, van der Meij EH, de Visscher JG. Fracture of the genial tubercles of the mandible: case report and review of the literature. J Oral Maxillofac Surg. 2014;72(10):1994.e1-6. DOI: 10.1016/j.joms.2014.05.001.
24. Freeman CO, Payne M, Martin N. Fractured and displaced genial tubercles: a case report. Oral Surg. 2014;7(S1):37-9. DOI: 10.1111/ors.12098.
25. Bacci C, Faccioli C, Cazzador D, Zanoletti E, Emanuelli E. Spontaneous genial tubercle fracture: management of a rare condition and literature review. Oral Surg. 2016;9(3):183-7. DOI: 10.1111/ors.12186.
26. Buduru K, Vankudoth D, Bhargava D, Thota M. Mandibular symphysis fracture associated with the displacement of a fractured genial segment: An unusual case report with review. J Indian Acad Oral Med Radiol. 2015;27(1):119. DOI: 10.4103/0972-1363.167130.
27. Wan C, Bowe C, Madhavarajan S. Spontaneous fracture of the genial tubercles of the mandible: A case report and review of the literature. Gerodontology. 2017;34(4):493-7. DOI: 10.1111/ger.12286.
28. Sasaki R, Okamoto T, Sangu N, Watanabe Y, Ando T. Genial tubercle fracture. J Craniofac Surg. 2019;30(1):161-2. DOI: 10.1097/SCS.0000000000004804.
29. Montoro Serrano EM, del Castillo Pardo de Vera JL, Aragón Niño Í, Cebrián Carretero JL. Fractura mandibular con arrancamiento de apófisis geni. descripción de un caso infrecuente. Rev Esp Cir Oral y Maxilofac. 2023;45(4):XXXX. DOI: 10.20986/recom.2024.1482/2023.
30. Papadiochos I, Goutzanis L, Petsinis V. Flail mandible and immediate airway management: Traumatic detachment of mandibular lingual cortex results in obstructive dyspnea and severe odynophagia. J Craniofac Surg. 2017;28(5):1311-4. DOI: 10.1097/SCS.0000000000003706.
31. Yano H, Hirata R, Nakashima M, Hirano A. The split fracture of mandibular symphysis. J Trauma. 2007;63(2):E55-8. DOI: 10.1097/01.ta.0000246894.84637.d3.
32. Bhargava D, Ahirwal R, Chakravorty N, Deshpande A. Vertically unstable fractured mandibular segment with attached genial tubercles as a parameter for difficulty during intubation for general anaesthesia. J Maxillofac Oral Surg. 2015;14(1):13-6. DOI: 10.1007/s12663-013-0610-8.