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Osteochondroma of the Mandibular Condyle: Literature Review and Report of a Case

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Abstract

Aim: The intent of this report is to present a brief review of the literature on osteochondroma and to present a case involving the surgical removal and replacement of a major portion of the condyle and angle of the mandible using free autogenous mandibular bone.

Background: While osteochondroma is the most common tumor of skeletal bones, it is relatively uncommon in the jaws occuring at the condyle or the tip of the coronoid process. This benign cartilage-capped growth is usually discovered incidentally on radiographic examination or on palpation of a protruding mass in the affected area. Malocclusion and progressive facial asymmetry are common findings in most cases of condylar osteochondroma.

Report: A case of a 29-year-old woman with an osteochondroma of the mandibular condyle is presented. Surgical treatment was tumor resection, grafting, and reshaping of the mandibular angle and ramus. As this lesion is usually asymptomatic and discovered incidentally on radiographic examination, the general practitioner usually is the first professional to make the diagnosis.

Summary: Condylectomy cannot be recommended as routine in all cases.[37] Common surgical treatments include condylectomy and reconstruction.[24] If the tumor involves only a limited area of the condylar surface, then preservation of the remaining portion of the condyle and reshaping should be done. Reasons for not taking

such a conservative approach are the possibilities of malignancy and the risk of recurrence. In this case report the extraoral vertical ramus osteotomy, associated with free autogenous mandibular bone, presented several advantages.

Keywords: Osteochrondroma, oral neoplasias, oral surgery, benign tumors

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Introduction

Osteochondroma or solitary osteocartilaginous exostosis is characterized by a cartilage-capped, osseous projection protruding from the surface of affected bone. While osteochondroma is considered the most common tumor of skeletal bones,[1-2] it is relatively uncommon in the jaws.[3] This tumor can occur singly or as part of an autosomal dominant syndrome known as osteochondromatosis.[4]

This report provides a review of the literature on osteochondromas, with a focus on the condylar region, and presents a case of osteochondroma of the condyle.

Review of the Literature

Several theories have been proposed to explain the pathogenesis of osteochondroma. In 1891 Virchow[5] postulated the physeal theory: a portion of the physeal cartilage becomes separated from the parent tissue then rotates 90 degrees and grows in a direction transverse to the long axis of the bone. He could not provide reasons for the separation and rotation of the detached physeal cartilage. In 1920 Keith[6] proposed a defect in the perichondral ring surrounding the physis is the cause of osteochondroma. Müller's periosteal theory states exostoses are produced by small nests of cartilage derived from the cambium layer of the periosteum.[7] Lichtenstein[1] theorized the periosteum has the potential to develop osteoblasts and chondroblasts. The osteochondroma could develop by spontaneous or induced metaplasia of the periosteum to form cartilage that subsequently undergoes endochondral ossification.

The rare osteochondroma of the mandible occurs at the condyle or the tip of the coronoid process.[8] This cartilage-capped growth accounts for 35.8% of benign bony tumors and for 8.5% of bony tumors overall.[9]

Malignant change is rare in solitary osteochondromas but does occur in approximately 5% of cases of multiple hereditary osteochondromatosis.[10] It occurs in adolescents or young children with the lesion being discovered between 10 and 20 years of age in about 80% of cases. Both sexes are equally affected.[9]

The histological distinction between osteochondroma and chondrossarcoma can be difficult, particulary when only a limited sample of tissue is available for histological analysis. Lack of high cellularity, pleomorphism, and plump cells with large or double nuclei favor a benign lesion.[10]

The lesion is usually discovered incidentally on radiographic examination or on palpation of a protruding mass in the affected area.[4,9] Malocclusion in the form of a lateral open bite on the contralateral side and progressive facial asymmetry are common findings in most cases of condylar osteochondroma. Pain may precede or accompany facial asymmetry in some cases.[14]

The radiographic image is one of a globular, radiolucent, lobulated mass which distorts the normal morphology of the mandibular condyle and can be differentiated from the elongated condylar process seen in hyperplasia.[11-13] The radiographic appearance of osteochondroma

can be pathognomonic, especially in long bones. The lesions usually point away from the joint space and can have a pedunculated stalk or sessile base.[14] On a conventional radiograph the osteochondroma may exhibit density with a sclerotic appearance. Computer assisted tomography (CT) scanning may help delineate the anatomy of the lesion and that of surrounding structures.[15]

An extensive review by Vezeau et al.[16] revealed the condylectomy is the surgical treatment of choice. The preauricular surgical approach, alone or in combination with other approaches, is most often used by the majority of surgeons. No reconstruction was reported in most cases. For cases in which joint reconstruction was performed, condyloplasty and discectomy were more frequently mentioned in the literature than costochondral grafting.

Conservative surgeries as viable treatment options for osteochondroma of the mandibular condyle were described.[17,49] In cases of condilectomy, total joint prosthesis reconstruction may be necessary such as in the case of a patient with a large osseous mass arising from the mandibular condyle and extending superiorly to the level of zygomatic process.[15]

Case Report

Diagnosis

A 29-year-old woman presented with the complaint of increasing facial asymmetry over a period of four years. Mouth opening was normal, but the mandible deviated 8 mm to the right side. There were no associated temporomandibular joint (TMJ) complaints nor associated pain. Clinical examination revealed an increased length of the left ascending ramus and a prominence of the left mandibular angle (Figure 1).

Panoramic radiograph revealed a mandibular asymmetry and a marked enlargement of the left mandibular condyle (Figure 2).

Sagital and coronal CT images revealed a large globular, mixed radiopaque/radiolucent condylar mass of the left TMJ (Figures 3 and 4).

The lesion extended superiorly into the articular fossa, but the cortical bone of the fossa was intact. The cortex of the tumor was continuous with that of the normal condylar bone. The pattern of the trabecular bone of the tumor blended with the intramedulary host bone.

A cintilographic image of the entire axial skeleton showed an increased captivation in the left condyle. Excluding this lesion, a normal symmetrical uptake pattern of the radionuclide was present throughout the skeletal structure, showing no evidence of multiple osteochondromas. Based in the clinical and imaging findings, a provisional diagnostic of osteochondroma or osteoma of the mandibular condyle was made.

Treatment

The patient was admitted to the University Hospital of the Pontificial Catholic University of Paraná, Brazil for surgical removal of the tumor. The eletrocardiogram, chest radiography, and routine urine and blood values were within normal limits.

The tumor resection, grafting, and reshaping of the mandibular angle and ramus were planned by tracing the intended osteotomies on acetate sheets (Figures 5 to 8).

A Risdon approach was created below the left mandibular angle to access the ramus and condylar neck. The pterygomasseteric sling was cut and detached, and the masseter muscle was vertically split to facilitate access to the angle, ramus, and neck of condyle.

An osteotomy was carried out as planned (Figure 6); a piece composed of the condyle (with the tumor), the posterior part of the ramus, and part of the horizontal border was removed (Figures 9 and 10).

The compromised condyle was also removed, and a graft was prepared by splitting and then fixing the fragments with #2 wires (Figures 7 and 11).

The graft was positioned into the fossa and fixed to the ramus with a #2 wire osteosynthesis (Figures 8, 12, 13, and 14). Intermaxillary fixation was mantained for two weeks.

Microscopic examination revealed cancellous, free autogenous mandibular bone with trabeculae of variable size. Cartilaginous inclusions were visible,

lined by a broad layer of partially loosened periosteal collagen tissue (Figure 15).

At the three-year follow-up, the patient presented with good facial symmetry and a stable occlusal relationship. Mandibular function was excellent, with a maximal incisal opening of 45 mm. A panoramic radiograph revealed good symmetry of the mandible, an adequate position of the graft, and a favorable condyloid shape (Figure 16).

Discussion

A total of 42 cases affecting the mandibular condyle, including the present case, have been reported in the English language literature. A literature review revealed tumors found in this region developed primarily during the fourth decade, with a mean age of 38.5 years and a male to female ratio of 1.0:1.2. Symmetry of the face was present in 83.3% of the reported cases. In 52.3% pain was a complaint, and in 30.9% there was mandibular hypomobility. As for surgical treatment, the preauricular approach was used in 64.2% of the cases, and in 64.2% of these cases condylectomies were performed. Reconstruction was performed in 50% of the cases. Reconstruction included either free autogenous bone or costochondral grafts and the insertion of a TMJ prosthesis (Table 1).

Summary

Condylectomy cannot be recommended as routine in all cases.[37] Common surgical treatments include condylectomy and reconstruction.[24] If the tumor involves only a limited area of the condylar surface, then preservation of the remaining part of the condyle and reshaping should be done. Reasons for not taking such a conservative approach are the possibilities of a malignancy and the risk of recurrence.[21]

The placement of the stump of the posterior border of the mandible into the glenoid cavity with reinsertion of the lateral pterygoid muscle and posterior fixation of the articular disc results in an anatomical remodeling and subsequently leads to very favorable stable function.[17]

The extraoral vertical ramus osteotomy associated with free autogenous mandibular bone used in this report presented several advantages. This technique allows immediate reconstruction and minimizes the risk of an infection and loss of the graft due to its similar histological characteristics. Furthermore, it prevents possible complications with a different donor site.

Figure 1. Inferosuperior view of the mandible showing the asymmetry.

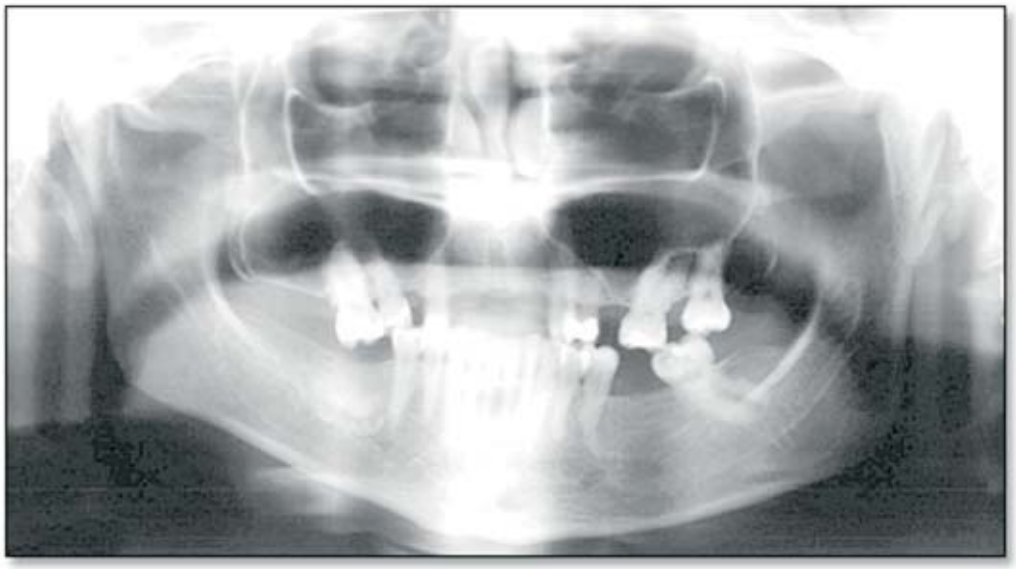

Figure 2. Initial panoramic radiograph showing the bulky shape of the left condyle and a marked deformity of the left mandibular body, angle, and ramus.

Figure 3. Axial CT. In this cut the tumor is clearly visible affecting the center of the condyle. The tumor is well delimitated and the bone cortical is preserved.

Figure 4. Coronal CT. Cortical preservation and tumor delimitation.

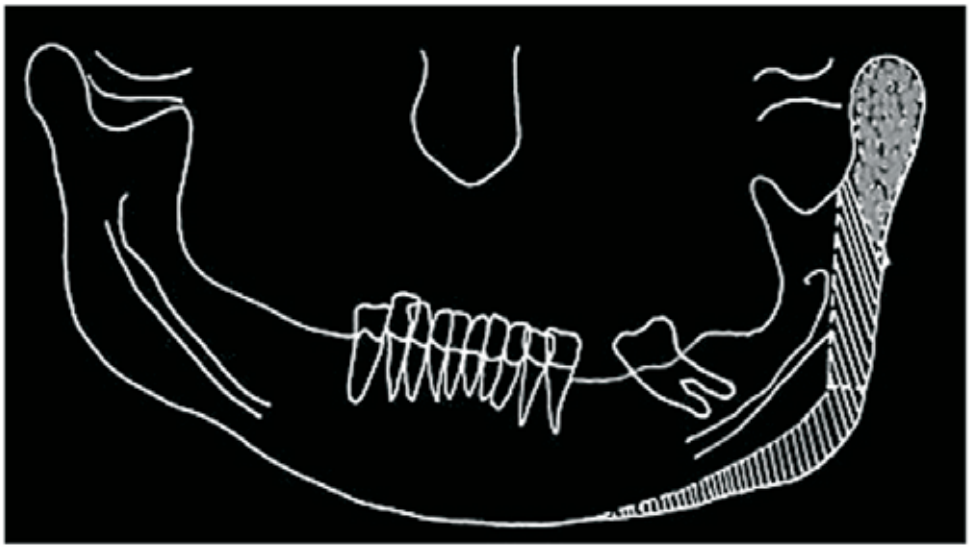

Figure 5. General plan of the osteotomies using a tracing on the panoramic radiograph.

Figure 6. Planned osteotomy.

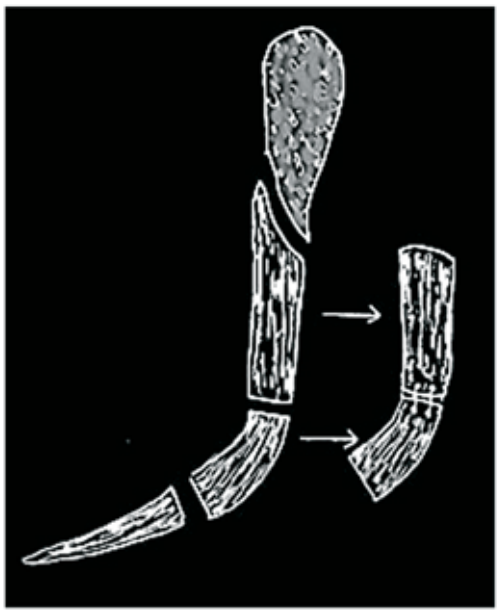

Figure 7. Planned autogenous graft.

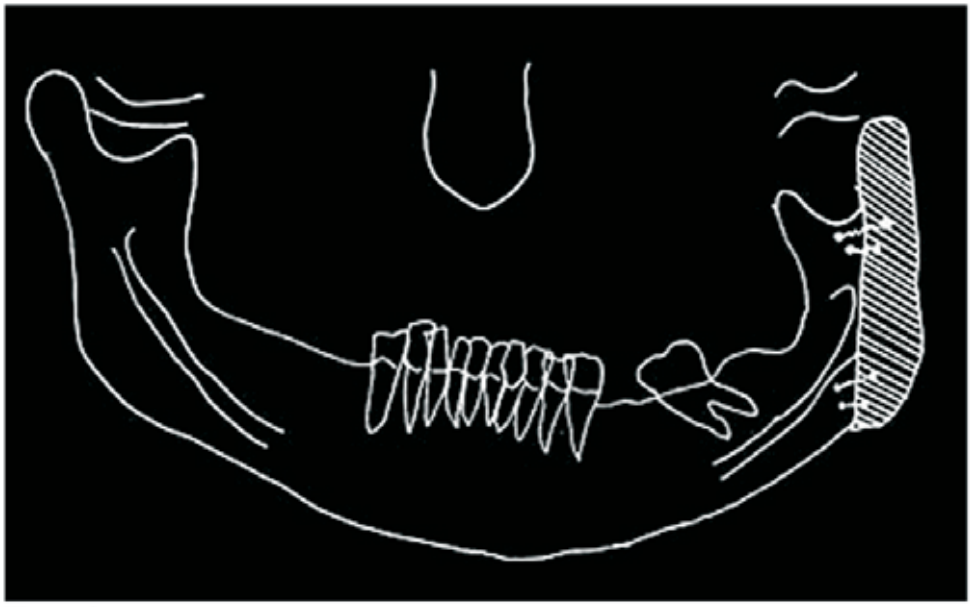

Figure 8. Planned position of the graft.

Figure 9. Osteotomy

Figure 10. Removed fragments including the condyle/tumor.

Figure 11. Bone split and contruction of an autogenous graft.

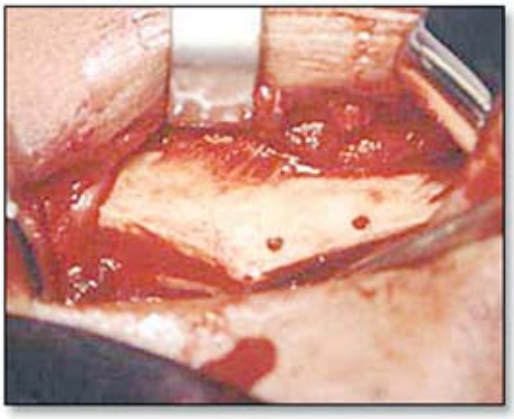

Figure 12. Prepared bed for insertion of the graft.

Figure 13. Positioned autogenous graft.

Figure 14. Immediate post-operative radiograph.

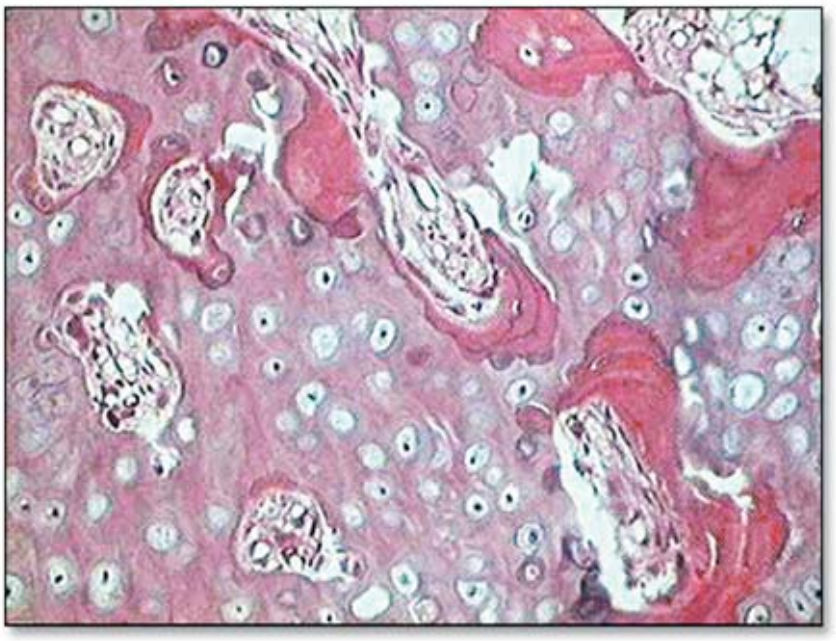

Figure 15. Cancellous bone with trabeculae of variable size; cartilaginous inclusions lined by a broad layer of periosteal collagen tissue. (HE 40 X)

Figure 16. A post-operative radiograph taken at three years. Note the fairly good shape of the condylar extremity.

Table 1. Summary of published cases of mandibular condyle osteochondromas.

Author(s)	Position	Side	Sex	Age	Symptoms	Appoach	Techinique	Reconstruction
Ribas et al 2007	Supero-medial	L	F	29	A	SM	EX, CL	EVRO, IIBO
Martinez-Lage et al 2004	NS	L	M	37	A, H, P	SM	EX, CL	EVRO
Martinez-Lage et al 2004	NS	R	F	33	A	SM	EX, CL	EVRO
Martinez-Lage et al 2004	Anterior-medial	R	M	36	A, H, P	SM	EX, CL	EVRO
Ongole et al 2003	NS	L	F	32	A, H, P	PA	CL	CP
Wolford, Mehra and Franco 2002	NS	R	F	32	NS	IO	EX, CL	SLFI, BSSO, IIBO
Wolford, Mehra and Franco 2002	NS	L	F	30	NS	IO	EX, CL	Lt SSO, IIBO
Wolford, Mehra and Franco 2002	NS	L	M	13	NS	IO	EX, CL	SLFI, BSSO, IIBO
Wolford, Mehra and Franco 2002	NS	R	M	17	NS	IO	EX, CL	SLFI, BSSO
Wolford, Mehra and Franco 2002	NS	L	F	26	NS	IO	EX, CL	SLFI, BSSO, IIBO
Wolford, Mehra and Franco 2002	NS	L	F	16	A, H	IO	EX, CL	SLFI, BSSO, IIBO
Aydin et al 2001	Inferoanterior-medial	L	F	47	P, H	PA	EX	None
Aydin et al 2001	Supero-medial	R	M	46	A	PA	EX	None
Peroz et al 2001	Anterior-medial	R	F	47	A, H, P	PA	EX	CP
Saito et al 2001	Anterior-medial	R	F	46	A	PA	EX	CP
Kurita et al 1999	Supero-medial	L	F	52	A	HC, PA, SM, ZA	EX	EVRO
Koole et al 1996	Supero-Dorso- lateral	R	M	40	A, P	PA	EX	None
Iizuka et al 1996	Medial	R	M	40	A,P	PA	EX	None
Karras et al 1996	Anterior-posterior and Temporal	L	F	42	A,P,H	PA, SM	EX, CL	CC,TJP
Vezeau et al 1994	Lateral	L	F	42	P	PA	EX	CP,DP
Vezeau et al 1994	Medial	L	M	25	A	PA	EX	CP, DP
Goyal and Sidhu 1992	Supero-medial		M	30	A	PA	EX	None
Gaines et al 1992	Medial	L	M	25	A, P, H, N	PA, SM	CL	CC
Henry et al 1992	Antero-medial	L	F	40	A, P, H	PA,TF,ZA,SM	CL	CC,CO,IVRO (Right side)
Herbosa and Rotskoff 1991	Superio-medial	R	M	21	A, N	PA	EX	CP
Loftus et al 1986	NS	R	F	19	A,P, N	PA,SM	CL	EVRO
Loftus et al 1986	Anterior*	R	F	57	A	PA	CL	None
Loftus et al 1986	Anterior*	R	M	60	NS	SM	CL	None
Schweber and Frensilli 1986	Anterior	R	F	19	A, P, N	PA,SM	EX	CP,DP,EP
Forssell et al 1985	Anterior-medial	L	M	42	A, P	PA	CL	None

Table 1. Continued.

Strickland et al 1985	Superior	R	F	30	P, N	PA	EX	CP, DE, SiS
Mizumo et al 1983	Anterior-posterior-superior-medial	L	F	63	A, N	PA,TF, ZA	CL	None
Kaneda et al 1982	Anterior-medial-superior	L	M	42	A, H	PA,TF,SM	CL	None
Johnson et al 1982	Anterior-medial	L	F	48	P	SM	CL	None
Eller et al 1977	Anterior-medial-inferior	R	M	69	A	IO	EX	CP,CO
Keen and Callahan 1977	NS	L	F	34	A	SM	CL	None
Koehl and Tilson 1977	Medial	R	F	35	A, N	PA	CL	EVRO
Sanders and McKelvy 1977	Anterior-superior	R	F	40	P, H, N	PA	CL	None
Simon et al 1977	Medial	L	F	49	A	PA, ZA	CL	None
Wang-Norderud et al 1975	Anterior-medial	L	M	32	A, P	PA	EX	DE
Thompson et al 1969	Anterior-superior	R	F	31	P, H	PA	CL	None
Hayward and Megquier 1968	Anterior-medial-inferior	R	M	34	A, P, H	PA, IO	CL	None
Melarkey et al 1966	Anterior-medial	L	M	34	A, P	SM	CL	None
Grossman 1965	Medial	L	M	58	P, N, H	SM	CL	None
Ramon et al 1964	Medial	L	F	30	A	PA	CL	None
Schultz et al 1960	Anterior-inferior	L	F	34	A	PA	CL	None
Curtin and Greeley 1959	NS	L	F	25	A, P, H	PA	CL	DE
Kanthak and Harkins 1938	Anterior	R	M	22	A	PA	CL	None

Abbreviations:
Position: NS, not specified;
*Location of lesion not specified in text, but panoramic radiographs locate lesion anterior to condyle (mediolateral orientation of lesion not known).
Side: L = left; R = right.
Sex: F = female; M = male.
Symptoms: A =asymmetry; H = hypomobility; N = noise; P = pain.
Approach: IO = intraoral; PA = preauricular , SM = submandibular; TF = temporalis flat; ZA = zygomatic arch osteotomy, HC = hemicoronal.
Technique: EX = excision; CL= condylectomy.
Reconstruction: CC = costochondral graft; CO = coronoidectomy; CP= condyloplasty; DE = discectomy; DP= discplication; EVRO = extraoral vertical ramus osteotomy; EP = eminoplasty; IVRO =intraoral vertical ramus osteotomy; SiS =silastic spacer; TJP = total joint prosthesis, SLFI = segmental Le Fort I; BSSO = bilateral sagittal split ramus osteotomy of the mandible; Lt SSO = left unilateral saggital split ramus osteotomy of the mandible; IIBO = ipsilateral inferior border ostectomy.

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