A Clinical Evaluation of 20 Patients with Ameloblastoma Following Partial Mandibular Resection

Anggraini S[1], Corputty JEM[2*], Sulistyani LD[2]

1. Oral Maxillofacial Surgeon, Dr. Drajat Prawiranegara Hospital, Banten, Indonesia.
2. Department of Oral Maxillofacial Surgery, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia.

Abstract

The reconstruction of mandibular defects post resection of the mandible presents challenges for the head and neck reconstructive surgeon. An objective evaluation of facial appearance, potential difficulties with opening the mouth, occlusion, and the condition of the reconstruction plate is required. A clinical assessment is also needed. The study objective was to report the findings of a clinical evaluation of patients with ameloblastoma following mandibular resection using a reconstruction plate. Methods used is a cross-sectional study was conducted on 20 such patients from 2012 2015. Facial asymmetry was investigated in relation to soft tissue features using extra oral photography depicting a full face frontal view, with a reference landmark, and an asymmetry index for the measurements. Intraoral and panoramic photographic examinations were conducted to clinically assess functional change. As a results: Facial asymmetry was identified in 45% of the patients. Functional changes were reported in 90% of the patients, who achieved appropriate occlusion of their remaining teeth. All were able to open their mouths without restriction. On orthopantomography, 15% of the patients had plate reconstruction-related complications. It was concluded that good functional and aesthetically pleasing facial effects are possible with the use of reconstruction plates when addressing mandibular defects.

Clinical article (J Int Dent Med Res 2017; 10(Special Issue): pp.434-440)

Keywords: clinical evaluation, mandible resection, reconstruction plate, asymmetry index

Received date: 14 August 2017 **Accept date:** 14 September 2017

Introduction

Ameloblastomas of jaws are benign odontogenic tumors with four clinical variants being solid multicystic type, unicystic type, extra osseous type and desmoplastic type.[1]The clinical appearance is generally asymptomatic and slow growing. It can perforate and resorb the cortical bone of teeth, as well as cause facial asymmetry.

Studies on ameloblastoma have been conducted worldwide, including Indonesia, with a focus on its epidemiology, etiology, cellular characteristics, surgical techniques used post surgery, and reconstruction evaluations. Ameloblastoma is a benign odontogenic tumor. It commonly occurs in the third and fourth decades of life, with more cases being confirmed in men than women.[1,2] Prevalence of 55% and 45% was determined in women and men, respectively, in the 2011 study by Corputty, E.E.Vitria, B.S. Latief at Cipto Mangun Kusumo Hospital, Jakarta.[3] Surgery is often required for ameloblastoma owing to its aggressive nature and high recurrence. There is a high incidence in the recurrence of solid and multi cysticameloblastomas (60–80%).

Resection, with 1 cm margins, is the treatment of choice. Recurrence rates of 4% for resection; 31% for enucleation alone; 16% for enucleation, followed by the application of Carnoy's solution; and 18% for marsupialization, with or without other treatment, have been reported in the second phase. Resection is the gold standard and currently constitutes the most predictable recurrence-free treatment for solid ameloblastoma.[1,2] Hong *et al.* demonstrated a significant correlation between recurrence and

Corresponding author:
Corputty JEM
Department of Oral and Maxillofacial Surgery
Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia
E-mail: corputty.johan@ui.ac.id

the treatment method used or histopathological type.[2] A resection with safety margin is the best method with which to treat most proven ameloblastomas, and conservative treatment is indicated for patients in their first decade of life or with unicystic or plexiform ameloblastoma.[1,2] The percentage of recurrence on resection was reported to be 5% for segmental resection, 12% for marginal resection, and 29% for conservative operations.[2]

Resection is the definitive treatment for ameloblastoma for oral and maxillofacial surgery cases at the Cipto Mangunkusumo Hospital, Jakarta. The reconstruction of mandibular defects presents a challenge for the head and neck reconstructive surgeon who has to employ an appropriate reconstruction and rehabilitation method to resolve the defects and related complications that result following either mandible or maxilla resection for ameloblastoma cases. The interruption to mandibular continuity results in both cosmetic and functional deformity. When undertaking mandibular reconstruction, the restoration of bony continuity alone should not be considered the sole measure of success.

The ultimate goal of mandibular reconstruction is to return the patient to his or her previous functioning state. The reconstruction can be supported using alloplastic material, plates and screws, a non-vascularized bone graft of the ribs or tibia, or the vascularized bone graft of the fibula bones. The therapeutic decision must target the elimination of pathology, as well as patient quality of life when planning rehabilitative therapy.[1,2]

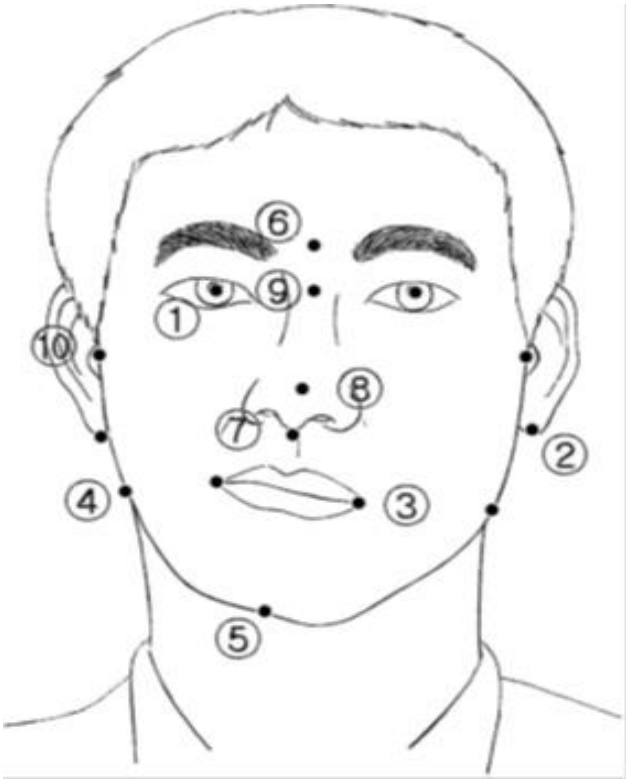
Thus, the study objective was to clinically evaluate post mandibular resection with plate reconstruction using extraoral and intraoral photography, and orthopantomography (OPG). Clinical appearance, potential difficulties with opening the mouth, and occlusion were objectively assessed.

Method

A cross-sectional study was conducted on 20 patients who had all treated by mandibular resection using a reconstruction plate at Cipto Mangunkusumo Hospital, Jakarta, Indonesia, from 2012–2015. The inclusion criteria were patients aged ≥ 18 years of age, those with a histopathological diagnosis of ameloblastoma, who had mandibular resection for which plate reconstruction was required, the absence of congenital facial asymmetry in the maxillofacial region, and who waited ≥ 6 months up to two years following mandibular resection prior to undergoing plate reconstruction.

The study was granted ethical approval by the faculty's medical ethics committee. The study objectives and protocol were explained to the patients who were asked to provide written informed consent.

Facial asymmetry was investigated subjectively in relation to the soft tissue features with the use of extra oral photography depicting a full face frontal view. The soft tissue landmarks used in this study were defined according to those described by Farkas and Lee (Figure 1 and Table 1).



1. Pp (pupil)
2. O (otobasioninferius)
3. Ch (cheilion)
4. Go (soft tissue gonion)
5. Me (soft tissue menton)
6. G (glabella)
7. Sn (subnasale)
8. Pr (pronasale)
9. Na (soft tissue nasion)
10. Pre (preaureculare)

Figure 1: Landmarks for the soft facial tissue.

Table 1: Definitions of the landmarks used in this study

Landmarks	Landmark definitions
Pp (pupil)	The definitive black circular opening in the center of the iris in the eye
G (glabella)	The most forward-projecting point of the forehead at the midline of the supraorbital ridges
Na (soft tissue nasion)	The middle point of the soft tissue frontonasal suture
O (otobasioninferius)	The inferior insertion of the ear
Sn (subnasale)	The point at which the columella merges with the upper lip in the midsagittal plane
Pr (pronasale)	The middle point of the outline of the nose tip
Ch (cheilion)	The most lateral extent of the outline of the lips
Me	Soft tissue menton. The most inferior point on the soft tissue outline on the chin
Go	Soft tissue gonion. The most everted point on the soft tissue outline of the angle of the mandible
Pre (preaureculare)	The most lateral point of the soft tissue facial outline in front of tragus
Zero point	The intersection of the midsagittal line and the horizontal line landmark

A 10-line reference system was used for the facial asymmetry measurements:

- Midsagittal line
- Horizontal line
- Bipupillary line
- Otobasioninferius line
- Lip line
- Gonion line
- Pronasale line
- Chin line
- Ramus line (right and left)
- Mandibular body line (right and left).

Details of these are shown in Table 2.

Table 2: Definitions of the reference lines applied in this study.

Reference lines	**Definitions**
Midsagittal line	G-Sn
Horizontal line	Perpendicular to the midsagittal line passing through the midsagittal line
Bipupillary line	Right Pp-left Pp
Otobasioninferius line	Right O-left O
Lip line	Right Ch-left Ch
Gonion line	Right Go-left Go
Pronasale line	Na-Pr
Chin line	Zero point-Me
Ramus line (right and left)	Pre-Go (right and left)
Mandibular body line (right and left)	Go (right and left)-Me

The photographs were taken with a digital Nikon® 3100 DX camera, with a distance of 1.5 m between the patient and the focus. The patients were seated in an upright position on a chair with same background color, with the Frankfort horizontal plane parallel to the floor. The patients looked directly at the camera lens. Their ears were exposed, and the distance between the exocanthus. The patients were placed in the occlusal rest position. Color photographs were taken from different angles and were printed individually on A5 paper. Thereafter, they were used to determine several soft tissue measurements (Figures 2 and 3).

Figure 2 a and b: Extra-oral images taken 11 months after mandibular resection with plate reconstruction showing preserved mandibular contours and facial symmetry.

(a) (b)

Figure 3 a and b: The intraoral examination provided evidence of good quality soft tissue and demonstrated that the resonstruction plate was not exposed. The occlusion evaluation of the patient's mandibles post resection was conducted with the use of intraoral photography.

The linear measurements were calculated using an asymmetry index. Each distance for the right and left soft tissue gonion landmark (Go) was measured from the midsagittal and horizontal reference planes, respectively. The asymmetry index was calculated using the following formula: asymmetry index (%) = R - L/M x 100, where R is the value of the right distance, L is the value of the left, and M is the average of the right and left values. Details of the measurements using photography can be seen in Figure 4.

Intraoral photographs were taken the frontal intraoral view and buccal intraoral view (right and left).

Cheek retractors were used to lift the lateral and outward teeth to achieve centric occlusion and so that the plane of occlusion was parallel with the camera. The photographic frame was filled with teeth and gingivae, from the one second premolar and the other second premolar.

OPG or panoramic radiography was then used for the postoperative evaluation, and showed the maxilla and mandible, temporomandibular joint, and plate reconstruction that had been performed for the patients.

Maximum mouth opening was possible. There was no deflection.

Figure 4: An intraoral image showing the condition of the soft tissue and the absence of difficulty in opening the mouth.

Results

Photographs were taken of the final sample, 12 (60%) females and eight males (40%), aged 62–62 years (a mean of 39.7 years) (Tables 1 and 2). The majority of the patients were aged 31–40 years. The age and gender distribution of the subjects is shown in Tables 3 and 4, respectively. As per the asymmetry scores, 45% of the patients' faces were categorized as symmetrical and the remainder as asymmetrical (55%) (Table 5).

Table 3: The age distribution of the subjects.

Age distribution (years)	Number of patients
10–20	1
21–30	1
31–40	10
41–50	5
51–60	2
61–70	1
Total	**20**

Table 4: The gender distribution of the subjects

Sex	*n*	%
Males	8	40
Females	12	60
Total	**20**	**100**

On clinical assessment of any functional changes via an intraoral and panoramic radiographic examination, 90% of the patients were demonstrated to have gained good occlusion of their remaining teeth and could chew food (soft or hard) and swallow liquids (Table 6).

Table 5: The results of the facial asymmetry evaluation for the 20 patients.

Normal	Asymmetry Index	Normal	Menton Shifting
≥3	10	≥3	8
≤3	10	≤3	12

Table 6: The results of the occlusion examination for the 20 patients

	Anterior occlusion	Posterior occlusion
None	8	3
Present	12	17

On OPG evaluation of the 20 patients, three of them (15%) had developed plate reconstruction-related complications; namely a broken plate in one patient and a dislodged condylar head in another two.

Discussion

The surgical reconstruction of mandibular bone defects after resection is necessary for the rehabilitation of patients with deformities caused by pathologic lesions. Surgical techniques have improved considerably over the last decade, but the reconstruction of large bone defects of the mandible remains challenging in maxillofacial surgery. The use of a titanium reconstruction plate system is critical to the success of the surgery. Mandibular defects that involve the loss of continuity require load-bearing systems to support mandibular function. The use of reconstruction plates has been considered in numerous studies owing to the considerable number of complications that ensue following resection, such as fractures to the plates and screws, plate exposure, and infection.

Therefore, mandibular discontinuity leads to severe cosmetic and functional deformities, such as facial asymmetry that result in facial disfigurement, as well as psychological challenges over the ability of patients to interact socially. Therefore, an assessment is needed post resection to evaluate the status of chewing,

swallowing, speech articulation, and oral competence. The ultimate goal of mandibular reconstruction is to return the patient to his or her previous functioning state.

Extra- and intraoral clinical examinations, panoramic radiography, occlusion and pathologic examinations are frequently used to make a diagnosis of facial or dental asymmetry. Examples of clinical examinations include an evaluation of the chin midpoint connected to the facial midline in an extra oral examination, and an appraisal of the observable dental midline distance in an intraoral examination. According to research, slight facial asymmetry is common in normal people. It was reported in one study that facial asymmetry becomes clinically noticeable when it is ≥ 3%. Elsewhere, it was stated that it is difficult to decide when normal asymmetry becomes abnormal. Generally, this is decided subjectively by the practitioner and is governed by the patient's perception of symmetry.[4-7]

Facial asymmetry is assessed through frontal extra oral photography, posterior anterior cephalometry, panoramic radiography and a three-dimensional (3D) examination. The frontal photographic examination is influenced by facial soft tissue and the precision of the diagnostic modality used. The cephalometric examination is based on the measurement hard tissue of the bones, which was impossible to perform in this research because half of the mandible had been resected to remove the tumor. A more accurate diagnosis can be achieved with a 3D examination but it is more expensive and involves excessive radiation exposure.[5,6]

Photograph taken from different angles, and anthropometric measurements were obtained based on facial soft tissue landmarks, starting with an imaginary sagittal line that began in the central hairline point and that crossed the central point of the nasal bridge, and the central point of cupid's bow in the upper lip and the bottom of the chin. Thereafter, the measurements were taken according to the definitions provided by Farkas for landmarks and by Lee for the reference lines, in conjunction with the asymmetry index results and Menton shifting.[4-7]

According to Proffit, although a good ratio in this regard is found in the natural teeth of most individuals, part of the population (5%) has some degree of disproportion with respect to tooth size.[4]

The dental midline is assessed via open bite, centric relation (CR), initial contact, and centric occlusion (CO). Skeletal and dental asymmetry appears to be similar in the CR and CO states, but functional deviation of the mandible occurs after the initial contact when asymmetry is caused by occlusal interference. This deviation can be in the same or in the opposite direction, and can become more prominent or be subtle. The slope of the occlusal plane is easily confirmed by asking patients to bite the tongue blade and by comparing the occlusal plane with the interpupillary line.[8]

In this research, patients who did not have teeth owing to jaw resection did not obtain occlusion, but those with smaller defects achieved better occlusion. Fixation with proper occlusion prior to resection was an important factor in determining occlusion.

OPG is a quick and inexpensive test that can be used to detect the reconstruction plate in the mandible. It can be employed to identify a broken reconstruction plate, and a shift in position of the condylar head or its dislodgement. This evaluation should be performed periodically especially as the mandible has a significant function while chewing, and this can lead to a broken plate, screw loosening, and shifting of the condylar head.

Conclusion

Reconstruction plates, as an option in the reconstruction of mandibular defects, are capable of obtaining a good functional and facial aesthetic result, either for small defects or those involving any part of the resected condyle. Anthropometric measurements were obtained, based on the facial soft tissue landmarks, starting with an imaginary sagittal line that begins at the central hairline point and crosses the central point of the nasal bridge, the central point of cupid's bow in the upper lip, and the bottom of the chin. The clinical assessment that can be performed on patients following resection of the mandible can be performed by evaluating facial asymmetry, occlusion, and a periodical appraisal of the reconstruction plate.

Acknowledgements

This study was completed with the support of lectures, the hospital, and patients. The authors would like to extend their gratitude to: Benny S. Latief, Professor of Department of Oral Maxillofacial Surgery, Faculty Dentistry, Universitas Indonesia. Pradono, Head of Department of Oral Maxillofacial Surgery, Faculty Dentistry, Universitas Indonesia. Maria Purbiati, Lecture of Department of Orthodontic, Faculty Dentistry, Universitas Indonesia.

The publication of this manuscript is supported by Universitas Indonesia.

References

1. R Bryan Bell.Odontogenic and Non-odontogenic Tumors of the Jaws. In: Andersson L, Kahnberg KE, Pogrel A.Oral and Maxillofacial Surgery. Hoboken: Wiley-Blackwell; 2012.
2. Hong J, Yun PY, Chung IH, et al. Long-Term Follow up on Recurrence of 305 Ameloblastoma Cases.Int J Oral MaxillofacSurg 2007;36(4):283-8.
3. JEM Corputty, EE Vitria, BS Latief. Frequency and Distribution of AmeloblastomaPatients According to Histopathologic Pattern, Age and Gender Period January 2002-December 2010.Int J Oral MaxillofacSurg 2011:40(10):1176.
4. WR Proffit, HW Fields Jr, DM Sarver. Contemporary Orthodontics. 4th ed. St Louis: Elsevier; 2007.
5. Lee MS, Chung DH, Lee JW, Cha KS. Assessing Soft-Tissue Characteristics of Facial Asymmetry with Photographs. Am J Orthod Dentofacial Orthop 2010;138(1):23-31.
6. HaridasKamble R, Thetay A, Hazarey P, Mundada R, Gupta M,Assessment and Comparison of Facial Asymmetry by Photographic and Radiographic Measurements: Using Visual Studio 2005 Software and Posteroanterior Cephalogram.J Indian Acad Oral Med Radiol 2011:23(4);527-30.
7. Chatrath P, De Cordova J, Nouraei SA, Ahmed J, Saleh HA. Objective Assessment of Facial Asymmetry in Rhinoplasty Patients. Arch Facial PlastSurg 2007;9(3):184-7.
8. Kook MS, Jung S, Park HJ, et al. A Comparison Study of Different Facial Soft Tissue Analysis Methods. J CraniomaxillofacSurg 2014;42(5):648-56.