PJSS Vol. 74, No. 2, July-December, 2019

PJSS PHILIPPINE JOURNAL OF SURGICAL SPECIALTIES

Recurrence of Mandibular Ameloblastoma on Autogenous Bone Graft: A Case Report

Glenn Eduard E. Oppus, MD and Jesusito S. Zubiri, MD, FPCS

Department of Plastic and Reconstructive Surgery, Vicente Sotto Memorial Medical Center, Cebu City

Presented is a case of a 62-year-old female who underwent segmental resection with iliac bone graft reconstruction for recurrent ameloblastoma. Another recurrence was noted 14 years later, this time with involvement of the osseous graft. A search of recurrences on bone grafts showed limited reports in literature. The authors explore possible reasons for this unusual occurrence and present current treatment recommendations in ameloblastoma management.

Keywords: ameloblastoma, head and neck surgery, oromandibular reconstruction, recurrence

Ameloblastoma, is an epithelial neoplasm that primarily involves the teeth bearing bones of the face. It comprises 1-3 percent of all head and neck tumors but ranks as the most frequent odontogenic tumor worldwide.[1-2] Although it is benign and slow growing, it is well recognized by surgeons because of its local destructiveness and its character of multiple recurrences after surgery.

The treatment of ameloblastoma requires complete surgical removal of tumor with margins of normal tissue to reduce recurrences. This is followed by coverage of the defects using vascularized bone flaps, non-vascularized bone grafts or a combined soft tissue flap and metal prosthesis for reconstruction.

The authors present an unusual case of an ameloblastoma recurring on an iliac bone graft.

The Case

A 62-year-old female presented to the Service with protracted facial deformity due to a left sided mandibular mass. Her past medical history showed that the condition started 27 years earlier as a gingival mass which was noted after she was treated for an abscess below her left second molar. Aspiration biopsy showed a dentigerous cyst which was subsequently excised. Regrowth of the gingival mass was noted six months after. After review of the pathology specimens, the diagnosis was amended to Ameloblastoma of the solid type. The mass was causing displacement of adjacent teeth and altering occlusion. Patient was referred to a head and neck surgeon for re-evaluation, where a biopsy confirmed the Ameloblastoma diagnosis. Surgery was recommended and a segmental resection was performed followed by mandibular reconstruction using non-vascularized bone graft from the iliac bone supported by titanium plates.

Ten years after the surgery, she returned to her attending surgeon for gingival swelling in the previous operative site. At this time, the patient did not consent to further surgery. The mass, left untreated, slowly grew to cause facial deformity. It made swallowing and mastication difficult. Patient had to resort to a soft to liquid diet to feed. Four years into the condition, the patient managed to seek help and was referred to the Department for evaluation (Table 1).

Physical examination showed a cachectic patient with altered speech. The tumor measured 15 cm x 10 cm grossly. It was firm, bulky and painless. Intraoral inspection showed an exophytic mucosal mass with smooth and pebbled surface resting on the edentulous portion of the mandibular body. It obliterated the left inferior buccal sulcus and tumor borders had encroached the floor of the mouth and left lingual sulcus medially, causing slight displacement of the tongue to the right.

Table 1. Timeline table.

Dates	Relevant Past History and Interventions		
-27 years	A gingival mass noted after treatment of an abscess in left lower second molar.		
-10 years	Aspiration biopsy interpreted as a dentigerous cyst. Excision done		
- 9½ years	6 months later, recurrence of mass; Review of pathology: Ameloblastoma Surgery: Segmental Resection, mandibular reconstruction with iliac free bone graft and plate		
-4 years	Recurrence of mass; no consent for surgery; loss to follow-up		
Dates	**Summary**	**Diagnostic**	**Interventions**
0 years	Mandibular mass 15 cm x 10 cm Facial deformity, feeding difficulties	CT scan: 8.9 cm x 7.8 cm x 8.2 cm mass in the left mandible,	
		Pathology: recurrent solid/multicytic Ameloblastoma	Left hemimandibulectomy with pedicled pectoralis major myocutaneous flap reconstruction
+3 years	No tumor recurrence		

The lateral margin of the tumor was adherent to the buccal mucosa and the tumor was confined within the retro-molar pad posteriorly. There was no active bleeding but there were minute mucosal ulcerations on the mass. Neck palpation revealed no palpable lymph nodes bilaterally. (Figure 1)

Multi-slice contrast enhanced Computed Tomography showed a heterogeneously enhancing lobulated mass containing cystic areas of low attenuation and necrosis at the left mandibular region measuring 8.9 cm x 7.8 cm x 8.2 cm in size, with involvement of the left buccal space pushing the tongue to the right side and encroachment on the mandibular prosthesis. There was extensive bone resorption on the left hemimandible but the frontal, orbital, maxillary, zygomatic and right hemimandibular bones are intact. Patient was diagnosed clinically with recurrent ameloblastoma with involvement of the iliac bone graft. (Figure 2)

A left hemi mandibulectomy with immediate reconstruction using a pedicled pectoralis major myocutaneous flap was planned. Patient was first referred to a nutritionist for buildup. She was cleared for surgery after cardio-pulmonary assessment.

Under general anesthesia, a split lip incision was made in the mid-mentum and extended laterally to the sub-mandibular area. The buccal mucosa was incised and soft tissue dissection was carried along the marked margins using electrocautery until the mass was elevated from the floor of the mouth and separated from the buccal lining laterally and posteriorly. A margin of normal bone was marked 15 mm away from estimated radiologic margin of the tumor as the osteotomy site. After periosteal stripping, the bone was divided using a Gigli saw. Posteriorly, the left temporo-mandibular joint was disarticulated. The expansile mass was removed as a whole and was sent for histopathologic examination.

A single 2.4 mm reconstruction plate was used to reconstitute the mandibular frame. The titanium plate was measured, cut and was bent to proportion with the chin projection of the contra-lateral side. Using 3 locking screws, the plate was anchored to the adjacent normal bone on the right mandible. The intraoral defect measured 8 cm x 6 cm. It was covered by a pectoralis major myocutaneous flap subcutaneously tunneled through the left side of the neck. (Figure 3) The skin paddle was carefully designed to close the donor site without deformity. Flap was inset on the defect without tension on the pedicle. The muscular side was used to cover the plate and cutaneous side was used to line the floor of the mouth. Jackson-Pratt drains were placed, followed by meticulous layered re-approximation of soft tissue, ensuring a watertight closure.

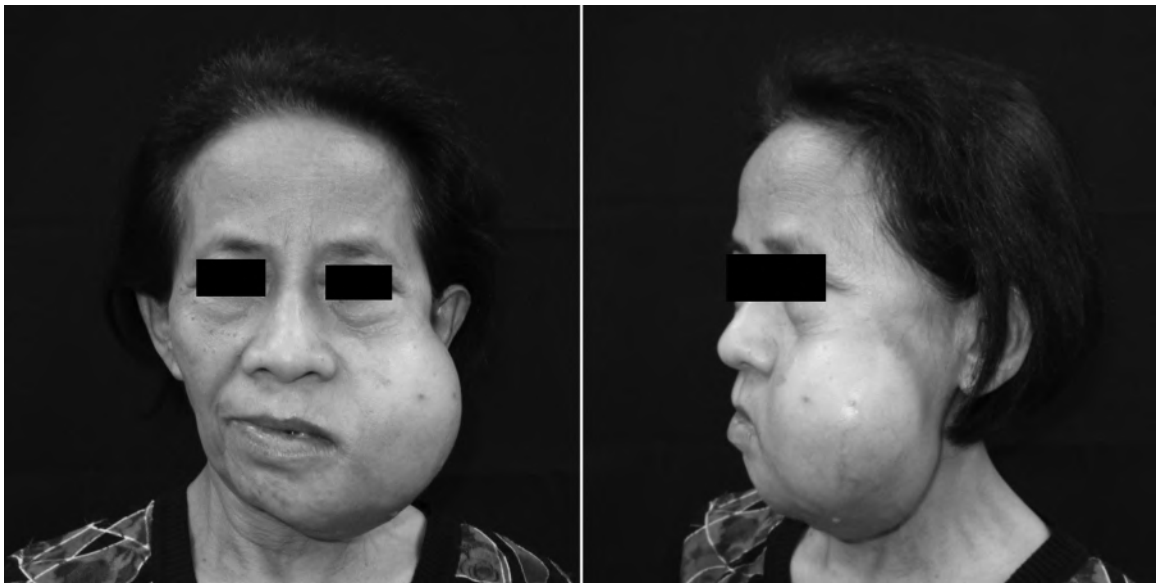

Figure 1. Pre-operative photograph of a 62-year-old female with a left mandibular mass.

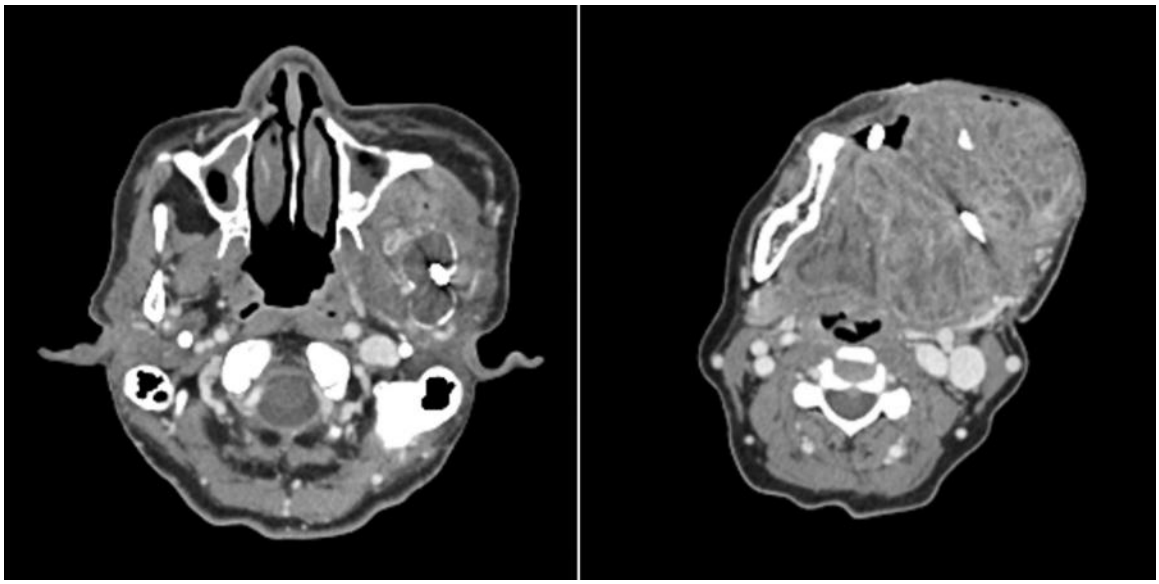

Figure 2. Pre-operative imaging.

Patient was placed on nasogastric tube feeding for three weeks. Drains were removed after the drainage was minimal. Oral non-chew diet was resumed when patient was comfortable swallowing pooled saliva. The donor site healed well without complications and patient was able to abduct the left arm without any weakness.

Final histopathologic report showed a gross specimen consisting of irregular lobulated mass measuring 10 cm x 8.5 cm x 6 cm and weighed 260 grams. On sectioning, the surface was pale tan in color, both solid and mucoid with areas of cystic degeneration. Microscopic examination showed a neoplasm composed of interdigitating cords with

strands of epithelial cells of the tall columnar type. Tumor cells have hyperchromatic nuclei with polarization away from basal lamina, which exhibited palisading pattern of the basal epithelium. All features of which, indicated that the recurrent tumor was of the solid/multicytic type of Ameloblastoma.

The patient was examined every 3 months and showed normal mouth opening and closure. There was improved articulation of speech, and swallowing was unhindered making patient maintain her normal body weight. So far, there were neither signs of plate failure nor tumor recurrence within the 3 years follow up. (Figure 4)

Figure 3. Intra-operative.

Figure 4. Post-operative.

Discussion

Ameloblastoma is a benign, disfiguring tumor of odontogenic origin that commonly involves the mandible and the maxilla. Because it is a specific disease of the jaw area, quite a few surgeons have comprehensive experience in its proper treatment. Its worldwide incidence is 1.5 cases per million making it rare among head and neck tumors. [1] Until recently, a combined epidemiologic study of 8544 cases of odotogenic tumors worldwide, showed that ameloblastoma comprise about 39.6%, making it the presently the most frequent odontogenic tumor.[2]

When WHO updated their classifications of odontogenic tumors in 2005, benign ameloblastoma was categorized under 4 main subtypes. The solid/muticystic ameloblastoma is the most common among the intra-osseous types, covering at 91%. Eighty percent of the time, it involves the mandible and has the highest recurrence rate among all other types. The unicystic or cystogenic ameloblastoma represent 5-15%. It has two sub-variants; luminal and mural type, both are less aggressive and have a lesser degree of recurrence.[3] Desmoplastic ameloblastoma is the third type, characterized by extensive desmoplasic stroma and a non-encapsulated tumor. It characteristically involves the anterior jaw and premolars.[4] The peripheral ameloblastoma is the fourth type, and is the only extra-osseous type of ameloblastoma. The tumor arises outside of the bone, from tooth bearing soft tissue like the alveolar mucosa and gingiva and is usually mistaken with other benign odontogenic tumors or basal cell carcinoma of the gingiva.[5]

The notoriety of ameloblastoma to recur repeatedly has baffled surgeons. It is histologically benign and yet patients have to undergo multiple surgeries in order to achieve control of disease. Recurrences have been reported to occur within 5 years on average from time of resection to as late as 40 years after.[6-7] Conservative approaches such as excision, enucleation and curettage were utilized regardless of subtypes resulting in recurrences reaching as high as 30-90 %.[8] Currently, unicystic ameloblastomas are treated by complete removal of tumor and cysts walls plus intra-operative adjuvant treatments of the bony margin to reduce recurrences. Multicystic/solid types are best managed with extended margins of resection.[9]

Success with wider margins of resection is still not absolute because of reports of recurrences. More importantly, the case presented has a recurrence on the bone graft itself. Osseous grafting is an integral aspect of mandibular reconstruction. Whether it is non-vascularized or vascularized, the successful restoration of bone continuity can serve as framework for dental implants. A restored dento-occlusal function is not only preferred but also improves the quality of life of patients post rehabilitation.[10]

A review of reports on recurrences involving bone grafts yielded only about 18 cases in literature. (Table 2).[11-24] The first report was in 1970, described first by Grafft and the ameloblastoma recurred on an iliac bone graft. A tabulated review by Jian, presented in 2015, is updated with 4 more reported cases. The table shows 12 recurrences from iliac bone, 5 from rib and 1 from free fibular bone. Most of the recurrences occurred in bone donors that had more cancellous bone exposure during reconstruction. Seeding on cancellous bone was enhanced because of the technique used. For example, non-vascularized bone grafting could use chipped cancellous bone spread over a vascular bed primarily intended to improve survival of graft will also in fact enhance growth of any implanted tumor seed. Subtypes that have the highest risk of recurrences were the intra-osseous types. These tumors grow well in the non-compact region within the center of the bone. If there is less cancellous bone exposure or contact, actual implantation and growth on cancellous bone is also minimized. This might explain why there were fewer recurrences in bone grafts that come with its own blood supply (Table 1)

There are two hypotheses to explain bone graft recurrences. The first, is the under-resection of the tumor either grossly or microscopically. The residual tumor cells on the bone stump repopulate and later involve the healthy transplanted bone. The second explanation is microscopic tumor seeding from either a mucosal or a marrow source. Tumor seeding is not a new idea, seeding of a normal tissue with tumor cells during surgery can result in metastasis.[25] Reports of surgically-induced seeding in malignancies like, wound metastasis in open surgery and port site metastasis in laparoscopic surgery are becoming an emerging problem for surgeons.[26] However, “benign metastasis” is also possible as evidenced by endometriosis

Table 2. Reported cases of Ameloblastoma recurrences involving the bone graft.

NO	YEAR	AUTHOR	AGE	SEX	LOCATION	RECURRENCE (YRS)	GRAFT USED
1	1970	Grafft[11]	15	F	Mandible - Left	13	Iliac
2	1976	Carvalho[12]	52	F	Mandible - Left	20	Iliac
3	1981	Dolan[13]	63	M	Mandible- Anterior	13	Rib
4	1982	Marinelli[14]		M	Mandible- Left	12	Iliac
5	1985	Stea[15]	39	F	Mandible- Body Left	7	Iliac
6	1988	Zacharides[16]	25	M	Mandible Body and anterior	36	Iliac
7			62	M	Mandible Ramus Left	3	Rib
8			48	M	Mandible- Left	4	Rib
9			22	F	Mandible- Body, Ramus Right	7	-
10	1995	Vasan[17]	42	M	Mandible- Body Right	28	Iliac
11	1998	Bianchi[18]	19	F	Mandible- Body Right	27	Iliac
12	2004	Martins[19]	17	M	Mandible- Body Right	16	Iliac
13	2005	Su[20]	55	M	Mandible- Body Left	16	Iliac
14	2006	Choi[21]	52	M	Mandible- Body Right	20	Iliac
15	2010	Essaadi[23]	59	M	Mandible-Symphysis Left	33	Rib
16	2015	Basat[24]	26	F	Mandible-Symphysis Left		Free Fibula Flap
17	2015	Jian[22]	33	M	Mandible- Right	16	Iliac
18			15	M	Mandible - Ramus Right	12	Rib

seen in ectopic locations.[27] One interesting report is the development of ameloblastoma on the iliac bone donor site which can only be explained by tumor contamination during the graft harvest.[28]

For primary treatment of suspected ameloblastoma, a biopsy and radiologic study is essential to identify the histologic variant first. This can aid in the decision whether to do conservative treatment or a more radical resection. Second, resection margins must be strictly observed in solid/ multicystic types, it can be based on radiologic data or intra-operative findings. Recommended margins are 1-1.5 cm from the radiologic margin.[29] Some advocate intra-operative frozen section in facilities with experienced pathologists to thoroughly check bone resection margins.[30] And third, an emphasis on meticulous surgical technique, can address the problem of iatrogenic tumor seeding.

Reconstruction of the mandibular defect is best done by completely replacing all lost tissues. In institutions with micro-vascular expertise, vascularized composite free flaps can replace bone and soft tissue with good success.[31] Most commonly used are the fibular free flaps held together by mini-plates. A more straightforward approach of mandibular reconstruction though is through the use of larger prosthetic metal plates. The thicker titanium systems used can withstand the three-dimensional forces experienced by the mandible during the return of function. With its improved biocompatibility, absence of donor site morbidity and it being readily available makes it widely accepted modality in mandibular restoration.[32]

In order to prevent plate failure, the appliance has to be covered with sufficient soft tissue to protect it from exposure. Vascularized musculo-cutaneous flaps have the advantage of reducing hardware related complications compared to coverage by mucosal tissue alone.[33] Vascularized free flaps are ideal because of more than adequate tissue coverage and reduced tension on the vascular pedicle. It does, however, require facilities with skilled micro-vascular surgeons. Furthermore, due

to the long hours required for this technique, it may not be suitable for high risk surgical patients.

The pectoralis major myo-cutaneous flap is the "workhorse" pedicled flap for head and neck reconstruction. Its attributes of ease in flap raising and vascular resiliency makes it dynamic and applicable to almost all nearby defects. Improvements in the technique have extended its reach of coverage, reduced its donor site related complication and showed its capacity to support bone as a composite flap.[34] Recent experience in centers with high volume mandibular reconstruction using load bearing titanium plates covered with pectoralis major flaps showed a high success rate and reduced flap related complications.[32,34-35] Bone tissue continuity may not be established via this approach but it in itself may have reduced ameloblastoma recurrence due to the absence of the bone tissue in the area.

Conclusion

Ameloblastoma is known for its clinical persistence after treatment. Regardless how intensive and elaborate the bony reconstruction performed, recurrences can still occur when there is inadequate tumor removal and indiscriminate tumor seeding. This report of ameloblastoma involving the bone graft, has provided insights in the pathogenesis of the recurrent disease. Furthermore, it has demonstrated that simple bridging plate reconstruction may be a valid alternative to the standard and may have an impact in the actual reduction of ameloblastoma recurrence.

References

1. Larson A, Almeren H. Ameloblastoma of the jaws. An analysis of a consecutive series of all cases reported to the Swedish Cancer Registry during 1958-1971. Acta Pathol Microbiol Scand A 86A (5): 337-49.
2. Avelar RL, Primo BT, Pinheiro-Noguiera CB, Studart, et al. Worldwide incidence of Odontogenic tumors. J Craniofacial Surg 2011; (6): 2118-23.
3. Barnes L, Everson JW, Reichhart P, Sidrasky D. World Health Organization Classificaton of Tumors: Pathology and genetics, head and Neck Tumor. Lyon: IARC: 2005
4. Pillai R, Ogole R, Ahsan A, Radhakrishnan R, Pai K. Recurrent desmplastic ameloblastoma of the maxilla:A case report. J Canadian Dental Assoc 2004; 70(2): 100-4.
5. Gardner DG. Peripheral ameloblastoma. A study of 21 cases, including 5 reported as basal cell carcinoma of the ginigiva. Cancer 1977; 39: 1625-33.
6. Carvalho ES, Moura JL, Sousa L, Borba M, BarrosS, Lopez MC. Radical Management of aggressive lesions: A case report of recurrent ameloblastoma. Rev Gauch Odontol 63(3): 327-30.
7. Morita H, Madoka I, Takashi T, Shinnosuke N, Miki N, Shinji Y, Toshiro T. Late recurrence more than 40 years of Mandibular Ameloblastoma: report of two cases. J Oral Maxillofacial Surg Med Pathol 2013; 25(3): 232-7.
8. Chae MP, Smoll NR, Hunter-Smith DJ, Rozen WM. Establishing the natural history and growth rate of ameloblastoma with implications for management: Sytematic review and meta analysis. Plos One 2015; 10(2): 1-13.
9. McClary A, West R, Mclary A, et al. Ameloblastoma: A clinical review and trends of management. Eur Arch Otorinolaryngol 2016; 273(7): 1649-61.
10. Carini F, Francesconi M, Saggese V, Monai D, Porcaro G. Implant supported rehabilitation of a patient with mandibular ameloblastoma. Annali di Stomatologia 2012; 3(2): 21-5.
11. Grafft ML, Sazima HJ, Parker FP, Rappaport I.Ameloblastoma recurring in previously placed iliac crest autograft:report of case. J Oral Surg 1970; 28: 285-91.
12. Carvalho FS, Valadad GA, Cespedes CE. Ameloblastoma(recurrence after 21 months)(J). Revista da Associação Médica Minas Gerais 1976; 27: 28-30.
13. Dolan EA, Angelillo JC, Georgiade NG. Recurrent ameloblastoma in autogenous rib graft. Report of case J Oral Surg Oral Med Oral Pathol Oral Radiol Endodontics 1981; 51: 357-60.
14. Marinelli M, Recurrence of an ameloblastoma in an autogenous iliac bone graft. J Oral Maxillofacial Surg 1985; 43: 374-7.
15. Stea G. Recurrence of an ameloblastoma in an autogenous iliac bone graft. J Oraland Maxillofacial Surg 1985; 43(5): 374-7.
16. Zacharides N. Recurrences of ameloblastoma in bone grafts. Int J Oral Maxillofacial Surg 1988; 17: 316-8.
17. Vasan NT: Recurrent ameloblastoma in an autogenous bone. Graft after 28 years: a case report. The New Zealand Dental J 1995; 91: 12-13.
18. Bianchi SD, Tarello F, Polastri F, Valente G. Ameloblastoma of the mandible involving an autogenous bone graft. J Oral Maxillofacial Surg 1998; 56: 1187-91.
19. Martins W, Favaro DM. Recurrence of an ameloblastoma in an autogenous iliac bone graft. Oral Surg Oral Med Oral Pathol Oral Radiol Endodontol 2004; 98: 657-9.
20. Su T, Liu B, Chen XM, et al. Recurrence of ameloblastoma involving iliac bone graft after 16 years (Case report). Oral Oncol EXTRA 2006; 42: 150-2.
21. Choi YS, Asaumi J, Yanagi Y, et al. A case of recurrent ameloblastoma developing in an autogenous iliac bone graft 20 yearsafter the initial treatment. Dentomaxillofacial Radiol 2006; 35: 43–6.
22. Jian XC, Liu D, Zhu R, et al. Recurrences of ameloblastomain bone graft: Report of two cases and literature review. OHDM 2015; 14(5): 323-6.

23. Essaadi M, Sif A, Benzaouia A. Rouadi S, Abadara RL, Mahtar M, et al. Recurrent ameloblastoma on a rib graft after 33 years, A case report and literature review. Rev Laryngo Otol Rhinol 2010; 131(4-5): 303-6.
24. Basat SO, Oreroglu AR, Orman C, Aksan T, Uscetin I, et al. Recurrent ameloblastoma in the free fibula flap: review of literature and an unusual case report. J Maxillofac Surg 2015;14(3): 821-5.
25. Shyamala K, Girish HC, Murgod S. Risk of tumor cell seeding through biopsy and aspiration cytology. J Int Soc Prev Community Dent 2014; 4(1): 5-11.
26. Mautone D, Dallasta A, Monica M. Isolated port site metastasis after surgical staging for lowrisk endometroid endometrial cancer: a case report. Onco Letters 2016; 12(1): 281-4.
27. Burney R, Giudice L, Pathogenesis and Pathophysiology of endometriosis. Fertil Steril 2012; 98(3) 511-9.
28. Martin-Oliva X, Ballart-Gavilla C, Fernandez-Suarez M, Navarro B, Valdes AP. Metastasis of an ameloblastoma to the iliac crest. Int Orthop 1994;18(1):50-2.
29. Becelli R, Carboni A, Cerulli G, Perungi M, Iannetti G. Mandibular ameloblastoma: Analysis of surgical treatment carried in 60 patients between 1977-1998. J Cranio Surg 13(3): 395-400.
30. Carlson ER. Marx RE. The Ameloblastoma: Primary curative surgical management. J Oral Maxillofac Surg 2006; 64(3):484-94.
31. Oliveria M, Rocha FS, Batista J, Moraes S, Zanetta-Barbosa D. Reconstruction of mandibular defects. Textbook of Advanced Oral and Maxillofacial Surgery 2013; 481-500.
32. El-Zohairy M, Mostafa A, Amin A, El-Fattah, Kalifa S. Mandibular reconstruction using pectoralis major myucutaneous flaps and titanium plates after ablative surgery for locally advanced tumors of the oral cavity. J Egyptian Nat Cancer Inst 2009; 21(4): 299-307.
33. Bussu F, Gallus R, Navach V, Bruschini R, Tagliabue M, et al. Contemporary role of pectoralis major regional flaps in head and neck surgery. 2014. Acta Otorhinolaryngologica Italica 34: 327-41.
34. Tripathi M, Sanjeev P, Karwasra R. Singh V. Pectoralis major myocutaneous flap in head and neck reconstruction: an experience in 100 consecutive cases. Natl J Maxillofac Surg 2015; 6(1): 37-41.
35. Salvatori P, Motto E, Paradisi S, Zani A, Podrecca S, Molinari R. Oromandibular reconstruction using Titanium plate and pectoralis major Flap. Acta Otorhinolaryngogica Italica 2007; 27: 227-32.