Investigating the Success of Implant Therapy in Patients With Fibro-osseous Lesions

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Introduction

Many factors impact successful osseointegration of implants including bone quality and local or systemic factors. Fibro-osseous lesions (FOL) are a diverse group of benign pathologies characterized by replacement of bone with fibrous tissues containing newly-formed mineral product. Such conditions include fibrous dysplasia (FD), cemento-osseous dysplasia (COD), and ossifying fibroma (OF). Implant behavior in these conditions is not well documented.

Research Aims

1. Review key differences in clinical and radiographic presentations of FD, COD, and OF.

2. Assess the quality and quantity of literature and documented success and complications of implants placed in patients with FOL.

3. Provide evidence-based recommendations to dental providers to guide clinical decision-making and informed consent discussions when implant rehabilitation is considered in patients with FOL.

Materials/Methods

Characteristics of each FOL were reviewed and compiled from a dental pathology text for comparison. Initial clinical information for a patient with COD desiring prosthetic rehabilitation was discussed and a clinical case following successful implant therapy for a patient with FD is described.

An electronic search of the literature was conducted by 2 authors (E. S., M. D.) on the PubMed database for related articles. The search terms were (fibrous dysplasia AND implant), (cemento-osseous dysplasia AND implant), and (ossifying fibroma AND implant). Articles were deemed eligible if they documented implant placement or complications with existing implants in patients with each respective disease and were published in English. "Complications" were defined as a problem requiring surgical or prosthetic intervention. Studies reporting implant placement for extraoral rehabilitation were excluded.

Each article was reviewed in full and key information was tabulated to document demographic data, implant success, and specific complications during the follow up period (when described). To assess for patterns in the frequency of complications for each disease following implant surgery, chi-square analysis was performed with SPSS (version 29.0.0.0 (241), IBM SPSS Statistics). Reported cases without record of follow up after implant placement were censored from final data analysis.

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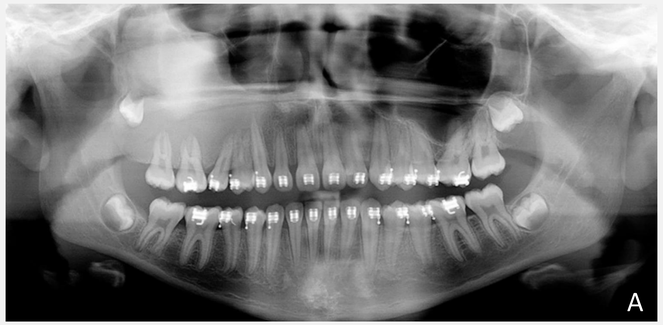
	Fibrous Dysplasia		Cemento-Osseous Dysplasia	Ossifying Fibroma
Demographics	M = F (monostotic) 2nd – 3rd decades	F > M (polyostotic) 1st decade	F > M 3rd – 6th decades Black > East Asian > White	F > M Broad range, peak 3rd - 4th decades
Typical Bones Affected	Max, Zyg >> Mand (monostotic)	Multiple (polyostotic)	Mand > Max	Mand > Max
Radiographic Presentation	Radiolucent or mixed ("ground glass") May see displacement, expansion		Single site (focal COD) or multifocal (periapical, florid COD) Radiolucent, then mixed/opaque as lesions mature	Similar to focal COD May see root resorption, bony expansion
Management	Lesions tend to stabilize at skeletal maturation Skeletal recontouring or lesion removal as needed		No lesion removal required Avoidance of elective surgeries	Enucleation and/or resection with grafting
Clinical Implications	Dysplastic bone, while immature, retains good vascularity		Hypovascular bone with abnormal bone fill if healing occurs Risk of secondary osteomyelitis, osteonecrosis, pathologic fracture	Normal bone fill after healing

Table 1: FOL characteristics. *Max = maxilla, Zyg = zygoma, Mand = mandible*



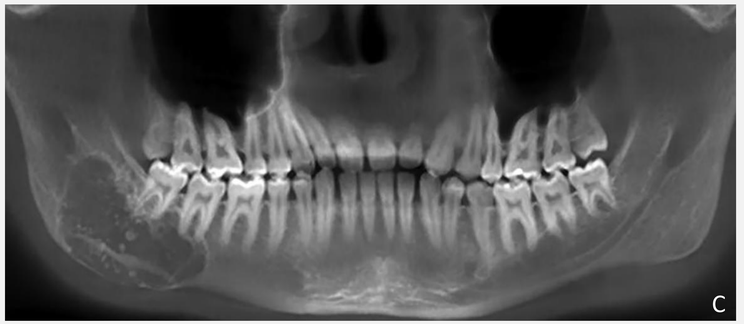


Figure 1: A. Fibrous dysplasia of the right posterior maxilla. B. Florid cemento-osseous dysplasia of the mandible. C. Ossifying fibroma of the right posterior mandible. *Courtesy of Neville et al., 2024.*

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Case 1: COD

A 58 y/o Black female presented in April 2023 to TAMU Graduate Prosthodontics with author E. S. with chief complaint of "I want to replace my missing teeth. I have my partial on top and nothing on the bottom. I'd like to save my teeth if possible."

Medical history was positive for type 2 diabetes mellitus, hypertension, and numbness of lower extremities suspected by medical providers to be secondary to transient ischemic attacks occurring over the last ten years.

Limited dental exam revealed gross caries and mobility on almost all remaining teeth. A series of panoramic radiographs (Fig. 2) revealed changing multifocal mixed, lucent, and opaque areas of the mandible over the ten-year documentation. Biopsy was performed at time of non-restorable tooth extraction in 2012 and confirmed florid COD.

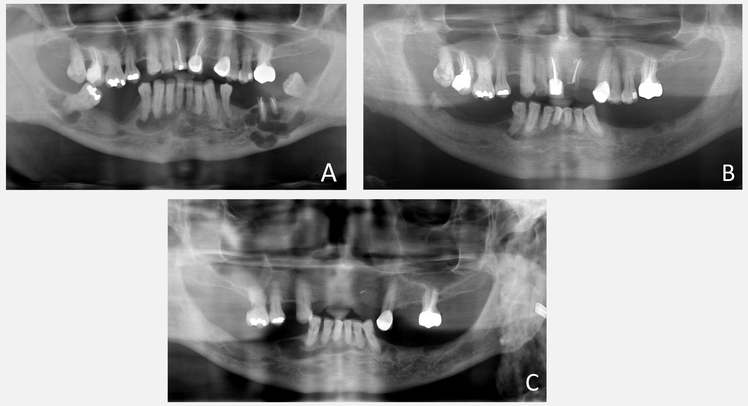

Figure 2: A. 2012. B. 2018. C. 2022.

Case 2: FD

A 71 y/o White male presented in June 2010 for assessment and subsequent implant-borne prosthetic treatment with author S. P. Cone-beam computed tomography (CBCT) analysis was completed and incidental finding of hyperdense, "ground-glass" bone suggestive of fibrous dysplasia was discovered. Later biopsy confirmed the diagnosis.

Patient underwent implant surgery to support maxillary and mandibular fixed complete dentures in November 2010. Insertion torque was sufficient for immediate loading (Fig. 5, 6). Definitive prosthetic rehabilitation was completed in September 2011 (Fig. 7). Patient was followed for eight years through the practice with no noted complications.

Figure 3: Pre-operative clinical photo

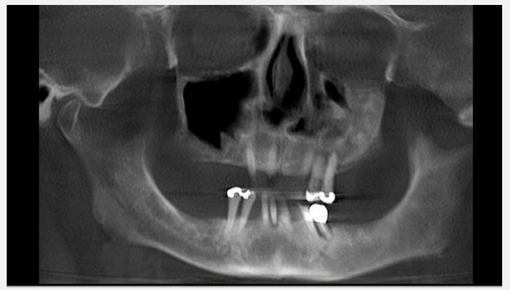

Figure 4: Pre-operative radiograph

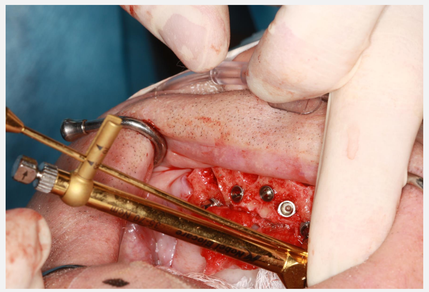

Figure 5: Implant placement

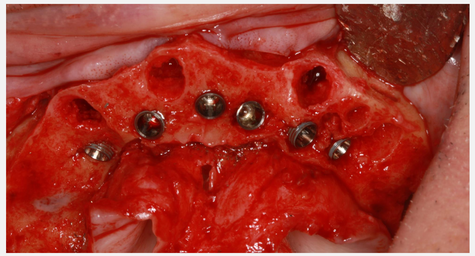

Figure 6: Implant placement

Figure 7: Final prostheses

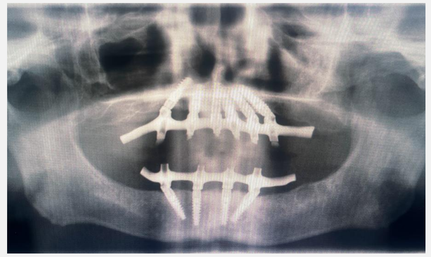

Figure 8: PAN obtained in June 2013

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Literature Review

Pubmed search revealed one narrative review and 26 relevant case reports documenting implant placement in patients with FD, COD, and OF. Of the total, six case reports for FD, six case reports for COD, and eight case reports for OF met eligibility criteria and followed patients after implants had been placed. Tabulated information for selected case reports for FD, COD, and OF are reported below (Tables 2, 3, and 4, respectively).

Frequency of complications among case reports for each FOL disease are reported in Fig. 9. Despite low case study counts, chi-square analysis was performed to investigate if complications were more frequent after implant placement based on the FOL disease. Preliminary data showed, within limitations of the search, there was no association of complications to a specific FOL disease (χ^2 p= 0.418, α = 0.05).

Table 2: Characteristics of included studies for **fibrous dysplasia**

Author	Year	Patient Age	Race	Sex	Variant	Bone Affected	Implants, n	Loading Protocol	Follow-up (mo)	Complications Reported*	
										Biological	Technical
Uckan et al.	2005	18	NR	Male	NR	Zyg	2	Delayed	36	None	Bar fracture
Mandeep et al.	2008	32	White	Female	Polyostotic	Max, Mand	12	Delayed	60	None	None
Kablan et al.	2023	35	NR	Female	NR	Max	4	Delayed	84	None	None
Adnot et al.	2019	64	NR	Female	Monostotic	Mand	5	Delayed	24	None	None
Petrocelli et al.	2014	10	NR	Female	NR	Mand	6	Delayed	12	None	None
Mendonca Caridad et al.	2008	35	NR	Female	Monostotic	Mand	6	Delayed	36	None	None

Table 3: Characteristics of included studies for **cemento-osseous dysplasia**

Author	Year	Patient Age	Race	Sex	Variant	Bone Affected	Implants, n	Loading Protocol	Follow-up (mo)	Complications Reported*	
										Biological	Technical
Esfahanizadeh et al.	2018	62	White	Female	florid	Mand	2	Delayed	18	None	None
Shadid et al.	2020	44	NR	Female	florid	Mand	2	Delayed	96	None	None
Gerlach et al.	2012	39	Black	Female	florid	Mand	1	NR	26	Sw, Mob, Expl x 1	None
Shin et al.	2019	70	NR	Female	florid	Mand	1	NR	Unknown	Sw, Pain, Fist, Seq, Expl x 1, OM	None
Bencharit et al.	2003	58	NR	Female	florid	Mand	5	Delayed	36	None	None
Park et al.	2019	39	NR	Male	focal	Mand	8	Delayed	192	PI, B, Pain, Expl x 2	None

Table 4: Characteristics of included studies for **ossifying fibroma**

Author	Year	Patient Age	Race	Sex	Variant	Bone Affected	Implants, n	Loading Protocol	Follow-up (mo)	Complications Reported*	
										Biological	Technical
Yoshimura et al.	2013	35	NR	Female	N/A	Mand	2	Delayed	120	None	None
Gerlach et al.	2012	39	Black	Female	N/A	Mand	1	NR	26	Sw, Mob, Expl x 1	None
Bouzid et al.	2023	39	NR	Female	N/A	Max	3	Delayed	12	None	None
Gurol et al.	2001	17	White	Female	N/A	Mand	5	Delayed	2	BG, Expl x 3	None
Marchiori et al.	2015	46	White	Female	N/A	Mand	3	Delayed	36	None	None
Kim et al.	2013	23	NR	Female	N/A	Mand	4	Delayed	105	None	None
Garcia Blanco et al.	2013	18	NR	Female	N/A	Mand	5	Delayed	12	None	None
Abdulwassie et al.	2001	22	NR	Female	N/A	Mand	3	Delayed	12	None	None

**Sw = swelling, Mob = implant mobility, Expl x n = explantation of n implants, Fist = fistula, Seq = bony sequestrum, OM = osteomyelitis, B = bleeding, BG = bone graft failure*

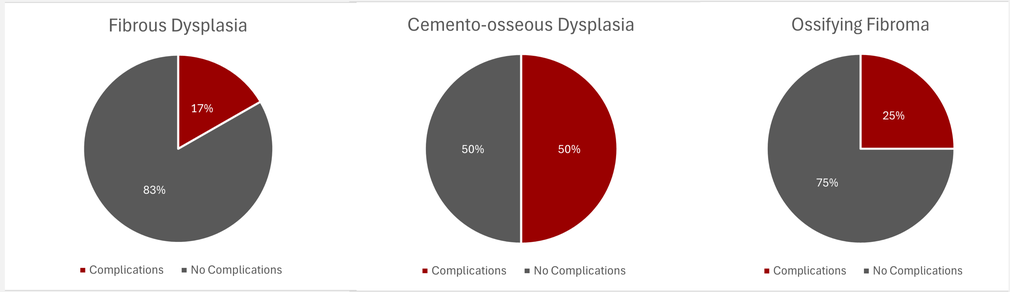

Figure 9: Percentage of reported complications for each type of FOL.

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Discussion

Literature review reveals low-level evidence consisting of narrative reviews or case reports documenting implant placement in patients with FD, COD, or OF. No clinical trials, implant success rates, or established guidelines were found. Treatment complications were reported in all three FOL types, though complication type and severity varied.

Successful implant therapy was described in FD by author S. P. and in the literature with follow-up of up to 7 years[10], possibly due to the tendency of lesions to stabilize and maintain good vascularity. Any reported complications involving FD were related to prosthetic failure specifically.

Mixed results on implant success in patients with COD were found. Successful rehabilitation prior to complications was noted in the literature up to 16 years[15]. Biologic complications did occur that required explantation in several case reports. However, unlike the other FOL, these biologic complications also demonstrated potentially more severe consequences, like osteomyelitis, which can be difficult to treat with systemic antibiotics due to the inherent poor vascularity of the bone.

OF lesions are typically enucleated or resected as part of their management with hard tissue grafting as needed, and case reports showed success of implant therapy during follow-up of up to 10 years[20]. Reported complications in OF were limited to biological failures requiring explantation. However, both instances of failure may not necessarily be attributed to the OF disease process itself. Gurol et al. attributed the failed implants to inadequate surgical technique in achieving primary closure. The other instance of reported complications in OF by Gerlach et al. was for a patient who was diagnosed by biopsy with both COD *and* nearby OF in the mandible. From this single publication it is difficult to attribute failure to one specific FOL which confounds analysis. As more literature amasses, it would be interesting to compare success and complications of implant placement in grafted bone of patients with and without history of OF.

This case report and literature review has several limitations. Few studies were available, affecting sample size and overall quality of analysis, and possibly contributed to the insignificant χ^2 results. Expanding the search criteria and search terms to include more databases and alternate names of the three FOL types may reveal more eligible studies and higher quality evidence. Reported data is likely unbalanced due to provider bias in reporting both successes or failures. Inconsistent reporting of patient demographics, surgical techniques, and aspects of prosthetic rehabilitation limited ability to derive clinical guidelines to inform decision-making.

Conclusions

1) No clinical guidelines currently exist, and evidence is limited on long-term success of implant rehabilitation in patients diagnosed with FOL.

2) Within the limitations of this study, no type of FOL had more frequently-reported implant complications than the others.

3) While complications to implant therapy are reported in all three types of FOL, COD may have more severe biologic complications. When encountering suspected FOL of the mandible, implant therapy should be approached with caution because COD is high on the differential list.

References

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