Intramedullary Fibrous Scar
321 Examples of a Previously Unreported Avascular Fibrosis of Jawbones

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Abstract

Background: Any amount of fibrosis in fatty marrow is pathological, but occasional cancellous jawbone curettings show only viable bone and dense collagen, similar to that seen with periapical scars and fibrous mucosal scars. Some patients have reported dramatic chronic pain reduction with removal of the fibrosis. **Objective:** To characterize a previously unreported lesion within jawbones. Methods: 321 cases and 100 controls (normal bone) were identified from a database of archival biopsies. **Results:** A total of 321 cases, usually in the posterior jaws, were found in patients with an average age of 48 years; 76% were females (controls: 43 years; 69% females). At least 51% of lesions were located in previous surgical sites, 37% were painful; 83% showed ischemic/inflammatory changes in adjacent marrow, but this was mild. The fibrosis was dense and almost completely avascular in 84% of cases; 43% had at least one focus of infiltration by lymphocytes. Attached bone was always viable and the etiology was not microscopically obvious except that 14% were associated with intramedullary foreign material, usually amalgam. Control cases showed no fibrosis of any type and were not associated with obvious ischemic or inflammatory conditions; differences between each lesional feature and controls were statistically significant at a level of $p > .0001$ (Pearson chi square analysis). **Conclusion:** Focal regions of dense, avascular fibrosis do occur within medullary spaces, possibly secondary to improper healing after surgery, but the etiology is unclear. We propose "intramedullary fibrous scar" as the appropriate diagnostic term. Clinical significance is unclear but a sizeable proportion of cases are associated with pain, hence, this does not appear to be equivalent to the periapical or mucosal scar.

Introduction

The classic intramedullary bone scar of long bones is a well demarcated, uniformly dense, radiopaque region of viable lamellar bone. It is presumed to represent a region of abnormal healing after small marrow infarction, with exuberant bone formation that does not remodel into normal bone over time but, rather, remains the same indefinitely. The reason for the exuberance or the lack of change over time is unclear, but the jawbone cases are similar (Figure 1), as near as can be determined. A different type of scar, fibrous in nature and, therefore, akin to scar tissue within soft tissues, is a common and well accepted lesion presenting as a small, well-demarcated radiolucency in the apical region of an endodontically treated tooth (Figure 2) or a poorly healed fracture line.

Some dental patients, however, present with well demarcated intramedullary aggregates of dense, almost avascular collagen fibers which are found in edentulous regions or between the roots of the teeth, not in apical bone (Figures 3-5). Since *no* amount of fibrosis is normal to fatty marrow, and since marrow fibrosis of *any* type is pathological, the present investigators elected to review and characterize a large series of such cases, identified only because one of them (JB) has fortuitously received thousands of jawbone marrow samples. No other US oral pathology biopsy service has had such a vast sampling of intraosseous, noncystic, nonneoplastic and non-endodontic pathoses.
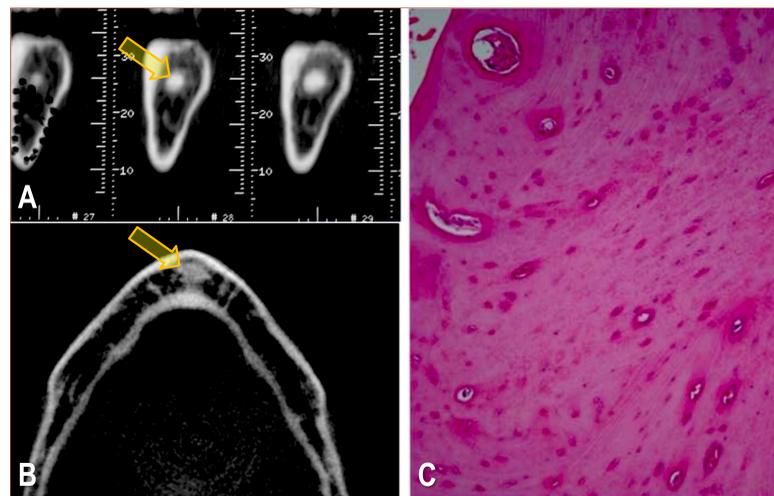
Figure 1: A & B) Typical bone scars (arrows) are well demarcated and uniformly radiopaque; C) histopathology is a bland sheet of viable lamellar bone with small spaces filled with fibrovascular tissue. Such scars are presumed to represent aberrant healing after focal intramedullary infarction and remain indefinitely once formed.
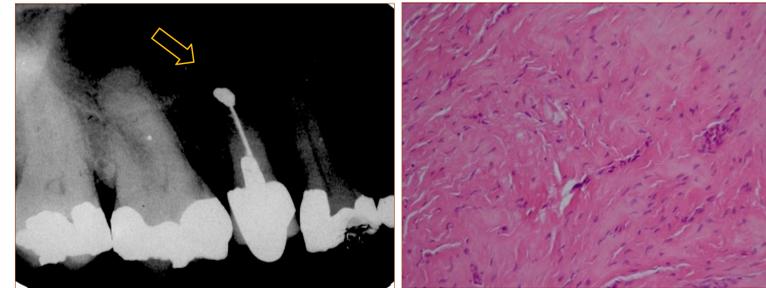
Figure 2: Typical periapical scar. A) a well demarcated, asymptomatic apical radiolucency (arrow) remaining after successful endodontic therapy; B) histology is avascular, dense collagen with minimal cellularity and no inflammatory cells.

Methods

Cases were identified from two surgical pathology service databases containing information on more than 11,000 samples of curettings from noncystic, nonneoplastic, non-endodontic lesions of cancellous bone and marrow of the jaws. All cases diagnosed or described as exclusively fibrous tissue within marrow spaces were reviewed. Those accepted as cases (n = 321) met the following inclusion criteria: 1) tissue was unequivocally identified as arising from cancellous alveolar bone; 2) fibrous tissue "islands" where seen within curetted marrow samples; 2) location, patient age and patient gender were provided; 3) lateral cortical alveolar surfaces were intact. Exclusion criteria included: 1) the fibrous tissue represented a nonsuppurative form of osteomyelitis or bone marrow edema; 2) the fibrous tissue represented a neoplasm, a region of poor fracture healing, a dental follicle or a cyst wall; 3) the lesion was located in the apical region of an endodontically treated tooth; 4) the lesion was associated with osteosclerosis. One hundred controls were taken from biopsy samples designated as "normal" in the databases. All cases and controls were blindly reviewed by one investigator (JB) to confirm the diagnosis and representative examples were reviewed blindly by another oral pathologist after calibration.

Results

Of 321 identified cases, subjects had an average age of 48 years; 76% were females (controls: 43 years; 69% females). Most lesions were located in the molar (73.3%) or premolar (18.2%) regions, and 64.5% were in the mandible (Figure 3). All cases were said to be radiolucencies by the contributing surgeon, but only 33 radiographs were submitted for review. Of these, 28 were well demarcated; 5 had poorly demarcated borders (Figures 4 & 5). 51% of lesions were located in previous surgical sites and 37% were painful. Some appeared to represent fiber filled old extraction sockets (Figure 7).

Amongst the cases, 83% showed ischemic/inflammatory changes in adjacent marrow, but this was mild and the lesion was microscopically well demarcated from the adjacent abnormal marrow (Figure 4B). The fibrosis was dense and almost completely avascular in 84% of cases (Figures 3,4,6); 43% had at least one focus of infiltration by lymphocytes (Figure 4E). Twenty two samples showed regions of myxoid change (Figure 6C & 6D). Attached bone was always viable and the etiology was not microscopically obvious except that 14% were associated with intramedullary foreign material, usually amalgam (Figure 6B). Control cases showed no fibrosis of any type and were not associated with obvious ischemic or inflammatory conditions (Figure 3C); differences between cases and controls for each microscopic feature were statistically significant at a level of $p > .0001$ (Pearson chi square analysis).
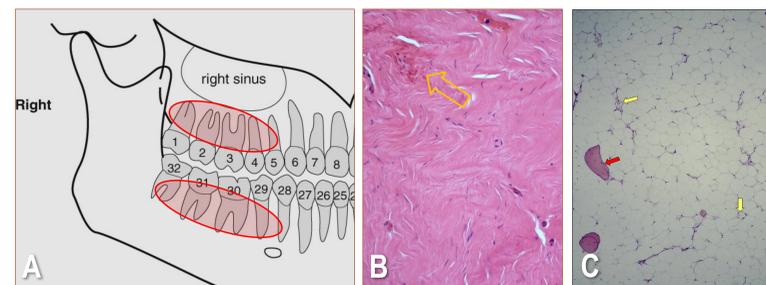

Figure 3: A) 91.5% of all cases were in the molar/premolar regions; B) histology was typically avascular, dense collagen, sometimes with hemosiderin deposits (arrow); C) control case (osteopenic, but with normal marrow) shows no fibrosis, with very mild capillary dilation (yellow arrows) and thin, viable trabeculae (red arrow).
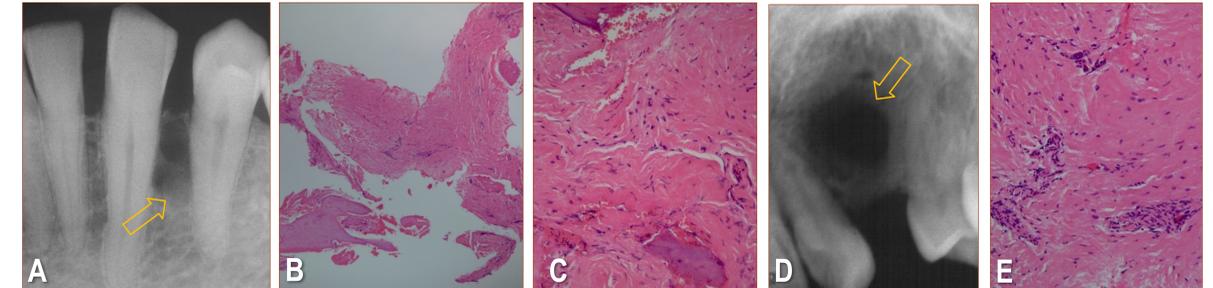

Figure 4: A) multilocular radiolucency (arrow); B) tissue from A shows well demarcated, dense fibrous tissue; C) dense collagen is avascular and may contain bone islands; D) poorly demarcated radiolucency was fiber filled and had intact cortices; E) some lesions had small lymphocytic infiltrates.
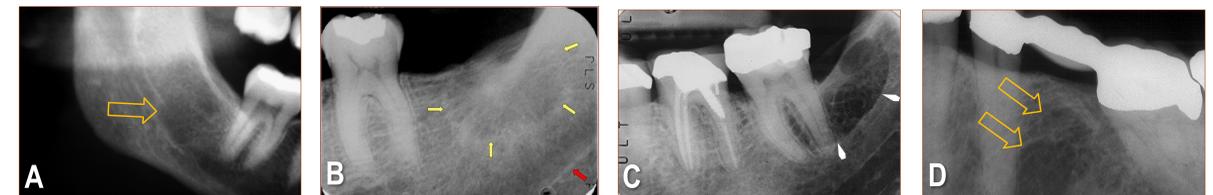
Figure 5. Radiographic presentations. A) moderately well demarcated radiolucency (arrow) shows partial destruction of the superior wall of the canal; B) "eagle's nest" radiolucency with radiating trabeculae (arrows), red arrow points to bottom of inferior alveolar canal, disease has destroyed the upper wall of the canal; C) well demarcated multilocular radiolucency (arrows); D) subtle, poorly demarcated subpontic radiolucency (arrows).
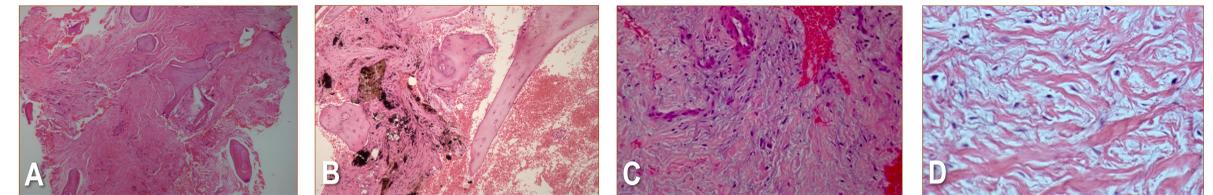
Figure 6: Microscopic variations. A) some scars contained scattered islands of relatively mature lamellar bone; B) some scars contained aggregates of amalgam and other foreign materials; C) occasional regions showed myxoid change admixed with the fibrosis; D) rarely, a myxoid region was much more loose than the rest of the lesion;
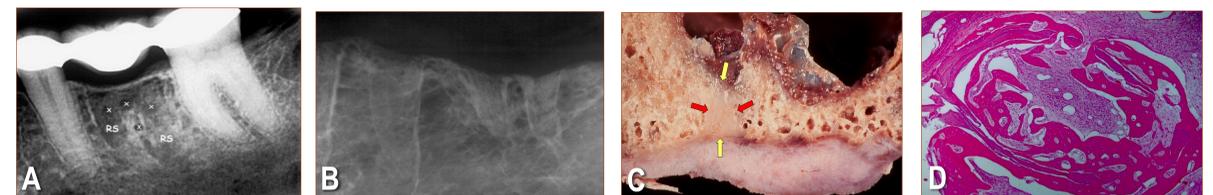
Figure 7: A) residual sockets (RS) beneath pontic remain decades after extraction; B) multiple old residual sockets; C) necropsy example of a fiber-filled residual socket (arrows), in this case with no cortex on the oral or sinus surfaces; D) cross section of a residual socket is fiber filled but also shows a rim of newly formed bone that did not remodel into full maturity.

Discussion

The present review of cases uses a convenience sample for its analysis and cannot, obviously, represent intramedullary fibrous scar in a population base. We have no idea how common this lesions is, nor do we know its clinical significance. We are aware, however, of at least a dozen cases in which the patient claimed considerable decrease in local pain with surgical removal of the scar. Additionally, we cannot say whether or not those examples which appeared to represent old extraction sockets filled with fibrous scar tissue are significantly different from those found within marrow spaces and lacking a surrounding lamina dura or bony "wall." We offer our analysis in order to provide a basic understanding of disease presentation and a diagnostic name. Future reports will refine and alter our understanding of this disease and, hopefully, better explain its etiology.

Conclusion

Dense fibrous scars are, in fact, found within the marrow spaces of alveolar bone of the jaws. We suggest that this is secondary to poor healing after local infarction or surgery. We further suggest that simple curettage is curative and may diminish or eliminate pain in those cases associated with pain.