

## Frontal sinus fracture in a Border Collie: treatment with a titanium mesh plate

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### INTRODUCTION

The objective of this case study is to present the use of a titanium mesh plate in the treatment of a comminuted frontal sinus fracture causing subcutaneous emphysema. To our knowledge, this type of indication has not been previously reported. Diagnosis was performed with radiographs and an MRI. Eight months following surgical treatment, the cosmetic results were deemed very good and no complications were noted.

### MATERIALS AND METHODS

A 3-year-old sterilized female Border Collie presented to the clinic following a cranial fracture that occurred the previous day. A stroller caused the injury.

During the clinical examination, external palpation of the left frontal bone caused pain. Deformation of the face and skull and crepitus during palpation were noted. There was evidence of left unilateral serous discharge and intermittent hemorrhaging.

Subcutaneous emphysema was present. Left hemi-facial trismus was also observed. Abdominal ultrasound and thoracic radiographs completed the initial examination and showed no anomalies.

The fracture site was assessed with skull radiographs and MRI. The radiographs were done with two orthogonal views associated with oblique views, making it possible to visualize the presence of subcutaneous air and an increase in the radiological density of the frontal sinus.

In addition to the emphysema, the skull MRI also revealed a fracture of the left frontal bone associated with depression of the frontal sinus. A small quantity of liquid was noted in the sinus. The cribriform plate appeared intact and the proximal central nervous system showed no sign of damage. No other anomalies were noted.

The animal presented an aggravation of the subcutaneous emphysema 48 hours after the initial trauma, with it extending to the abdominal region. Surgery was planned.

**Surgical treatment** - The animal was pre-medicated with Morphine and then induced with Diazepam (Valium, Roche) and Alphaxalone (Alfaxan, Dechra). After intubation, the animal was maintained with Oxygen and Isoflurane.

The face was shaved and aseptically prepared. A central sagittal approach was used to access the left frontal bone. The fracture was comminuted and the zygomatic process of the frontal bone was impacted. It was reduced with pointed forceps. The fracture hematoma was conserved. Part of the exposed nasal mucous membrane was intact but with a loss that seemed to be the cause of the emphysema.

A titanium mesh plate was fashioned on the skull in order to create a dome fitting the shape of the skull and making it possible to bypass the bone loss. Two compresses of hemostat collagen (Surgicel, Ethicon) were applied to seal the zone.

The titanium plate was positioned and attached using 8 2-mm cortical titanium screws. The screws were positioned in the areas allowing for maximal bone anchoring following the medial nasomaxillary buttress and the medial septum separating the two sinuses. After abundant rinsing, the frontal and temporal muscles were carefully sutured, sealing the zone.

### RESULTS

The animal remained hospitalized for 3 days following the operation. For pain management, it received Morphine every 4 hours, along with Meloxicam and Amoxicillin antibiotics. The animal presented a decrease in the subcutaneous emphysema as early as the third day. When the sutures were removed on the 12th day, we noted a complete absence of emphysema, no pain at the surgical site, and a good cosmetic aspect.

Three months later, a radiographic checkup revealed no anomalies and good tolerance for the implants. We noted no specific opacity in the frontal sinus. The animal was controlled clinically at 8 months and presented no anomalies at the surgical site.

### CONCLUSION

Facial fractures are difficult to apprehend. When dental occlusion is preserved, conservative treatment is often recommended<sup>1</sup>. In our case, the medial naso-maxillary buttress was impacted, without causing any de-

fects in dental coaptation. In addition to the esthetic prejudice caused by the depression of this zone, the damage to the zygomatic process of the frontal bone ran the risk of causing a lack of lateral support of the eye<sup>1</sup>. As the face was deformed and the subcutaneous emphysema was spreading, surgery was indicated.

Several cases of comminuted fractures of the maxillary and the nasal bone have been treated with titanium miniplates using the principles of facial buttress line reconstruction<sup>2,3</sup>. In our case, the issue was primarily a functional deficit due to a depression of the sinus. It required covering the entire injury site in order to provide scaffolding for bone and mucous membrane healing.

Other reconstruction alternatives could have been:

- A PMMA mold, which presents the risk of lesions during exothermic polymerization and is less well tolerated.
- A porcine small intestinal submucosa (PSIS) graft, which presents excellent tolerance but provides limited mechanical support [4].
- A cortical-cancellous bone allograft, which presents a risk of non-optimal biocompatibility and would have been difficult to model for the bone injury found in this case.

Titanium presented the advantages of good rigidity and intraoperative adaptability. It also allowed for post-operative radiographic and MRI follow up without paramagnetic artifacts if required.

It is a biocompatible material that had already been used successfully for cranial reconstruction. Indeed, use of meshed plates in veterinary medicine has been documented for cranioplasty following skull tumor resection and reconstruction of foramen magnum decompressions [5, 6]. To our knowledge, its use for frontal sinus reconstruction has not yet been reported.

We chose to position titanium screws for stabilization, in order to increase rigidity of the assembly and enable healing of the fracture. The contact between the screws and the subjacent structures was less risky than in a calvaria reconstruction.

The reconstruction of this injury led to a full resolution of the symptoms and good cosmetic results. No complications linked to the implant were noted during our 8 months of follow-up.

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