

Case Report

Surgical correction of pectus excavatum in two cats

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Two sexually intact male Bengal cats, one a 4-month-old weighing 2.8 kg and the other, a 3-month-old weighing 2.0 kg, were presented to the University of Missouri-Columbia Veterinary Teaching Hospital for evaluation of respiratory distress. On initial presentation, both cats were dyspneic, exercise intolerant, and had marked concave deformation of the caudal sternum. Surgical correction of pectus excavatum was performed using a cylindrical external splint and U-shaped external splint. Post-operative thoracic radiography revealed that there was decreased concavity of the sternum and increased thoracic height at the level of the caudal sternebrae in both cats.

Keywords: cat, external splint, pectus excavatum, surgical correction

Pectus excavatum or funnel chest is an uncommon congenital anomaly of the chest wall, characterized by the dorsal deviation of the caudal sternum and associated costal cartilages or a ventral to dorsal narrowing of the entire thorax [3]. This defect has been reported in both dogs and cats, and can usually be diagnosed within the first few days following birth [2]. Abnormal alignment of the sternum and costal cartilages are responsible for compressive cardiopulmonary dysfunction resulting in exercise intolerance, tachypnea, cyanosis, cardiac murmur, arrhythmias, or respiratory distress [3,7]. Pectus excavatum-associated cardiopulmonary dysfunction may be life threatening. Several surgical techniques for repair of pectus excavatum have been described in dogs and cats. The use of U-shaped external splint (X-Lite classic splint; EBI Biomet, USA) has not been previously reported.

The aim of this case report was to describe the successful surgical correction of pectus excavatum using U-shaped external splint in one cat and cylindrical external splint (Orthoplast; Johnson & Johnson, USA) in the other cat.

Two sexually intact, male Bengal cats were presented to the University of Missouri-Columbia Veterinary Teaching Hospital for evaluation of respiratory distress. One was a 4-month-old weighing 2.8 kg and the other, a 3-month-old weighing 2.0 kg. Both cats exhibited mild dyspnea from birth. The owners described progressive respiratory difficulty in the animals over the past several weeks. Upon initial presentation, both cats were tachypneic, exercise-intolerant, and had a large concave deformation of the caudal sternum. Marked abdominal effort was associated with respiration in both cats. A diagnosis of pectus excavatum with marked dorsal deviation of the caudal sternum was made. Thoracic radiographs revealed dorsal displacement of the caudal sternebrae (Fig. 1), beginning at the 5th sternebra (Case No. 1) and the 4th sternebra (Case No. 2) respectively. The cardiac silhouette was displaced dorsally in the lateral view and left laterally in the dorsoventral view in both cases (Fig. 1). No definitive radiographic evidence of a peritoneopericardial diaphragmatic hernia was observed in either case. To determine the severity of the deformity, the frontosagittal indice (FSI) and vertebral indice (VI) were determined. The FSI and VI were calculated to be 2.4 (reference range, 0.7 to 1.3) and 6.5 (reference range, 12.6 to 18.8) in Case No. 1, and 2.8 and 6.9 in Case No. 2 respectively.

Surgical correction of the defect was performed on the day following admission. Prior to surgery, a cylindrical external splint for Case No. 1 and U-shaped external splint for Case No. 2 were contoured to the normal shape of the patient's thorax (Fig. 1). The patients were positioned in dorsal recumbence. Stay sutures were placed around the sternebrae using 0 polypropylene (Ethicon, USA) from the manubrium cranially, to the xiphoid caudally (Fig. 1). The suture ends were left long and tagged with mosquito hemostats (Fig. 1). All stay sutures were passed through the holes on the apex of the splint using an 18-gauge needle and then tied securely (Fig. 1). In Case No. 1 the splint was held in place with the umbilical tape at the cranial aspect, acting as shoulder straps. Velcro straps were placed dorsally to ensure proper splint positioning. In Case No. 2

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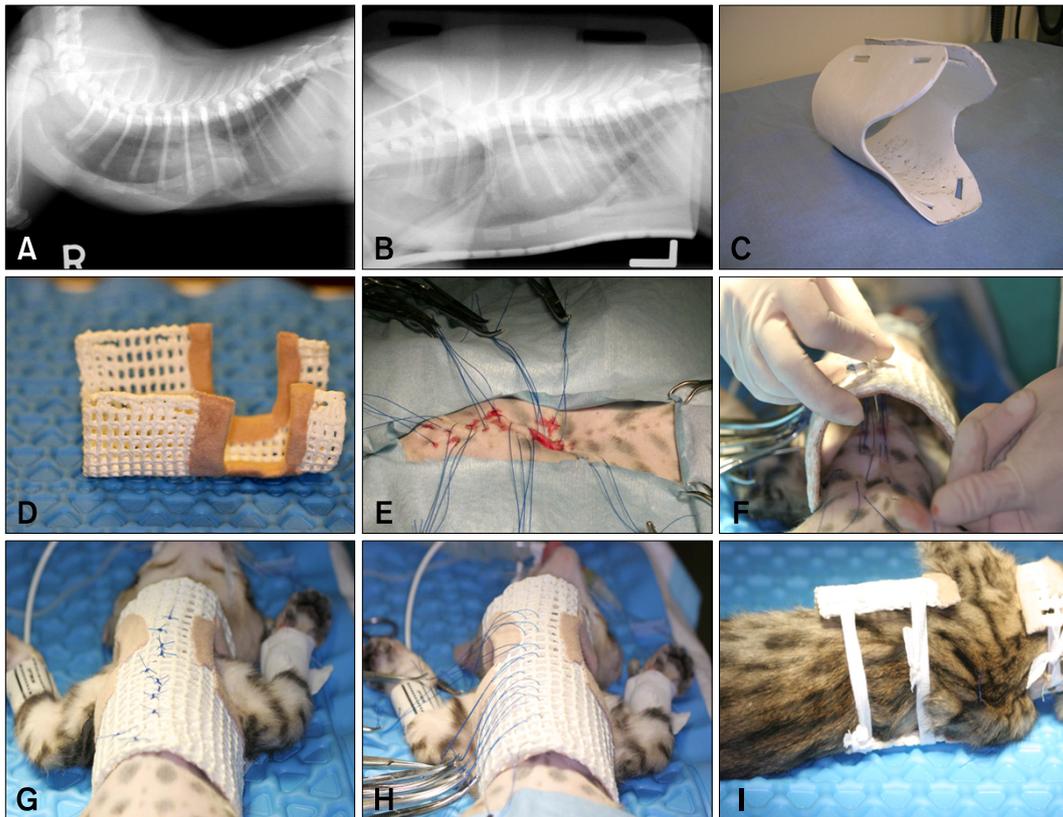


Fig. 1. Radiographic findings and surgical procedures using cylindrical external splints (C: Case No.1) and U-shaped external splint (D: Case No.2). The caudal sternbrae were dorsally displaced (A: Case No. 1). Dorsal deviation of caudal sternbrae was reduced (B: Case No. 1). Stay sutures were placed around the sternbrae from the manubrium cranially, to the xiphoid caudally (E: Case No. 1). All stay sutures pass through the holes on the apex of the splint using an 18-gauge needle (F: Case No. 2). Mosquito hemostats are used to hold the ends of the individual stay sutures (G: Case No. 2). All stay sutures were tied securely (H: Case No. 2). The splint was held in place with umbilical tapes (I: Case No. 2).

the splint was held in place with two umbilical tapes passed through the holes at the lateral ends of the splint (Fig. 1). Post-operative thoracic radiography revealed decreased concavity of the sternum. Abdominal effort was no longer associated with respiration in both cats. The FSI and VI were 1.8 and 8.3 in Case No. 1, and 1.7 and 10.5 in Case No. 2 respectively.

The splint was removed from both cats five weeks post surgery. No evidence of dorsoventral recompression of the thorax was noted on thoracic radiography in both cases. Patient follow-up performed at 14 months (Case No. 1) and 4 months (Case No. 2) after surgery revealed that both cats were clinically normal, active, and exhibited no evidence of respiratory distress.

Pectus excavatum is a congenital deformity of the thoracic wall characterized by abnormal traction of the skeletal tissues and defective osteogenesis as well as chondrogenesis, resulting in a lack of rigidity of skeletal tissues [3]. This skeletal deformity necessitates surgical repair for a return to normal function in the cardiopulmonary system. Three types of surgical repair for

pectus excavatum have been described in cats and dogs: external splinting [1,4,5], internal splinting [6,7] and longitudinal sternbral pinning combined with external splinting [1]. In the external splinting type, moldable splinting material is used to contour a U-shaped or V-shaped splint [1,4,5]. In the internal splinting type, veterinary cuttable plate or aluminum splint rod is used to realign a noncompliant sternum in cats [6,7]. This technique requires the exposure of the site of sternal deviation and placement of the plate after correction of the deformity [6,7]. In the longitudinal sternbral pinning combined with external splinting, moldable splinting material and a Kirschner pin are used to realign a noncompliant sternum in a cat [1]. In this technique, a Kirschner pin is inserted through the sternum from the manubrium to fourth sternbra [1].

In the present case report, an external splint using a thermoplastic casting material was used in both cats. The advantages of external splinting using a thermoplastic casting material include the ease to contour to the normal shape of the patient's thorax and a lower degree of

invasiveness compared to internal splinting or a longitudinal sternbral pinning. In young animals, the costal cartilages and sternum are flexible and the thorax can be reshaped by applying permanent traction to the sternum with an external splint [2]. This technique has provided good results and is cited as the treatment of choice to repair pectus excavatum deformity in young dogs and cats that are less than four months of age [4,5]. In this case report, Case No. 1 was 4 months old making it a less desirable candidate for external splinting. External splinting was performed after flexibility of the sternum and costal cartilage was confirmed using stay sutures placed around the sternum in Case No. 1. Maturation of the sternum and costal cartilages may decrease the likelihood of successful surgical correction of the pectus excavatum when using an external splint. Internal splinting or longitudinal sternbral pinning combined with external splint can be considered as an alternative technique when permanent sternbral rigidity is encountered.

Contouring the external splint to the normal shape of patient's thorax can facilitate the concave sternum and associated costal cartilages to gain a more natural position. The material and size of the external splint should be considered based on the size of the patient. Heavy or inappropriately sized external splints can cause discomfort and excitement leading to respiratory distress. U-shaped external splint (Case No. 2) is lighter in weight and holes for sutures are pre-constructed, as compared to cylindrical external splint. U-shaped external splint is preferable for young and small dogs or cats that are not likely to hold a heavy external splint.

Some anatomical considerations may increase the likelihood of a successful surgery. Inflated lung lobes are located in close proximity to the sternum and improper suture placement can result in lung puncture or laceration. Passing the needle as close to the sternum as possible can

help avoid inadvertent pneumothorax.

This case report describes the successful surgical correction of pectus excavatum using thermoplastic external splint in two cats. Retrospective or prospective study is required to further explore appropriate technique selection based on age for the treatment of dogs and cats affected by pectus excavatum.

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