Clinician’s Guide to the CT and Gross Anatomy of the Sandtiger Shark (Carcharias taurus)

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Materials and methods
A two metre-long 100kg captive male Sand tiger shark (Carcharias taurus) was presented immediately post mortem.

The cadaver underwent spiral CT* to evaluate a suspected spinal lesion and to provide CT anatomical data for comparison with gross anatomy and external landmarks (see below).

Contiguous 5mm slices of the entire length of the cadaver were made using exposure values of 130kV and 67mAs with the animal in ventral recumbency. Ten 10cm thick sections were made at levels predetermined to coincide with CT slices to demonstrate key areas of anatomical interest.

The cadaver was frozen and later sectioned using a band saw. The sections consisted almost entirely of muscle. The caudal vein and artery, completely surrounded by the cartilaginous haemal arch, radiopacity than the surrounding muscle.

The kidneys lay dorsally, enclosed by the epaxial muscles and bounded ventrally by the ureters / urinary vesicles. They extended from the level of the pelvic fins to that of the mid dorsal fin. They were discernible on CT by virtue of their fat content and thus slightly lower density than the surrounding muscle. The spleen was a narrow strap-like organ. Its soft tissue opacity was poorly visible on CT.


Materials and methods

• The heart was a relatively small organ surrounded by a pocket of fat. It was enclosed ventrally by the sternum and dorsally by the caudal part of the basihyal (tongue).

• The liver was the largest organ. It occupied almost one third of the total length of the shark from the level of the pectoral girdle to mid dorsal fin. The liver overlapped slightly with the heart, its cranial tip lying dorsal to the ventricle. Clearly the liver formed a “Y” shaped transverse section filling the body cavity ventral to the oesophagus. The gallbladder was present at the level enclosed by the small central tube of the liver, The left liver lobe extended ventrally along the left side of the abdomen, whereas the right lobe spiralled from right to left, terminating just cranial to the tip of the left lobe. The liver had a low radiopacity on CT due to its function as a storage organ for fat in the form of oil.

• The kidneys lay dorsally, enclosed by the epaxial muscles and bounded ventrally by the ureters / urinary vesicles. They extended from the level of the spinal fin to that of the pelvic fins. They were discernible on CT by virtue of their fat content and thus slightly lower density than the surrounding muscle.

• The spleen was a narrow strap-like organ, its soft tissue opacity was poorly visible on CT.

• The kidneys lay dorsally, enclosed by the epaxial muscles and surrounded ventrally by the ureters / urinary vesicles. They extended from the level of the dorsal fin to that of the pelvic fins. They were discernible on CT by virtue of their fat content and thus slightly lower density than the surrounding muscle.

• The body cavity extended to the level of the pelvic fins, between which the caecum was seen as a faint fat opacity. Caudal to this point the sections consisted almost entirely of muscle. The caudal ven and artery, completely surrounded by the cartilaginous haemal arch, were further protected by cartilage in the ventral midline supporting the fat. The latter accounts for vascular access difficulties.

Learning outcomes

• The heart was a relatively small organ surrounded by a pocket of fat. It was enclosed ventrally by the sternum and dorsally by the caudal part of the basihyal (tongue).

• The liver was the largest organ. It occupied almost one third of the total length of the shark from the level of the pectoral girdle to mid dorsal fin. The liver overlapped slightly with the heart, its cranial tip lying dorsal to the ventricle. Clearly the liver formed a “Y” shaped transverse section filling the body cavity ventral to the oesophagus. The gallbladder was present at the level enclosed by the small central tube of the liver, The left liver lobe extended ventrally along the left side of the abdomen, whereas the right lobe spiralled from right to left, terminating just cranial to the tip of the left lobe. The liver had a low radiopacity on CT due to its function as a storage organ for fat in the form of oil.

• The stomach was a long saccular organ, occupying the second quarter of the shark’s length. It was traced on CT by virtue of its luminal gas. The gastro-oesophageal junction was level with the pectoral fins.

• Although the skeleton of the elasmobranch is classified as cartilage, it was seen here to be variably mineralised throughout (150 to 900 HU). This shark showed localised kyphosis and scoliosis of the spine cranial to the dorsal fin, similar to published reports of captive sandtiger and other wild sharks. Proliferative mineralisation, equivalent to bony remodelling in other species, was present ventral and lateral to a number of deformed vertebral bodies.

• The spleen was a narrow strap-like organ, its soft tissue opacity was poorly visible on CT.

• The kidneys lay dorsally, enclosed by the epaxial muscles and surrounded ventrally by the ureters / urinary vesicles. They extended from the level of the spinal fin to that of the pelvic fins. They were discernible on CT by virtue of their fat content and thus slightly lower density than the surrounding muscle.

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Materials and methods

A two-metre long 100kg captive male sandtiger shark (“Barney”) was presented immediately post mortem. The cadaver underwent spiral CT* to evaluate a suspected spinal lesion and to provide CT anatomical data for comparison with gross anatomy and external landmarks (see below).

The anatomical sections were compared to demonstrate key areas of anatomical predetermination to coincide with CT slices. Ten 10cm thick sections were made at levels predetermined to coincide with CT slices to demonstrate key areas of anatomical interest. The anatomical sections were compared with corresponding CT sections to enhance understanding of the CT anatomy and provide an overview of the location and extent of individual organs relative to palpable external landmarks.

Anatomical Key

1. Neural arch
2. Spinal cord
3. Vertebral body
4. Hard palate
5. Oral cavity
6. Basihyal (tongue)
7. Ceratohyal
8. Gill slit
9. Opistharynx
10. Oesophagus
11. Heart
12. Sternum
13. Pectoral girdle
14a. Pectoral fin
14b. Dorsal fin
15. Testis
16. Dorsal artery
17. Stomach
18. Spleen
19. Kidney
20. Ureter
21. Urinary bladder
22. Seminal vesicle
23. Intestine
24. Intestinal valve (intestine)
25. Claspers
26. Haemal arch
27. Caudal artery
28. Caudal vein

Learning outcomes

- The heart was a relatively small organ surrounded by a pocket of fat. It was enclosed ventrally by the sternum and dorsally by the caudal part of the basihyal (tongue).
- The liver was the largest organ. It occupied almost one third of the total length of the shark from the level of the pectoral girdle to mid dorsal fin. The liver overlapped slightly with the heart, its cranial tip lying dorsal to the ventricle. Cranially the liver formed a “Y” shaped transverse section filling the body cavity ventral to the oesophagus. The gall bladder was present at this level enclosed by the small central lobe of the liver. The left liver lobe extended ventrally along the left side of the abdomen, whereas the right lobe spiralled from right to left, terminating just cranial to the tip of the left lobe. The liver had a low radiopacity on CT due to its function as a storage organ for fat in the form of oil.
- The stomach was a long ovoid organ, occupying the second quarter of the shark’s length. It was traced on CT by virtue of its luminal gas. The gastro-oesophageal junction was level with the pectoral fins.
- Although the skeleton of the elasmobranch is classified as cartilage, it was seen here to be variably mineralised throughout (150 to 900 HU). This shark showed localised kyphosis and scoliosis of the spine cranial to the dorsal fin, similar to published reports of captive sandtiger and other wild sharks. Proliferative mineralisation equivalent to bone remodelling in other species, was present ventral and lateral to a number of deformed vertebral bodies.
- The spleen was a narrow strap-like organ. Its soft tissue opacity was poorly visible on CT.
- The kidneys lay dorsally, enclosed by the epaxial muscles and bounded ventrally by the ureters / urinary vesicles. They extended from the level of the dorsal fin to that of the pelvic fins. They were discernible on CT by virtue of their fat content and thus slightly lower radiopacity than the surrounding muscle.
- The body cavity extended to the level of the pelvic fins, between which the cloaca was seen as a faint fat opacity. Caudal to this point the sections consisted almost entirely of muscle. The caudal vein and artery, completely surrounded by the caudal and ventral haemal arches, were further protected by cartilage in the ventral midline supporting the tail fin. The latter accounts for vascular access difficulties.

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4 Scottish Agricultural College, New Haven, Rural Edinburgh EH9 3IG

Materials and methods

A two metre long 100kg captive male Sand tiger shark (“Sandy”) was presented immediately post mortem. The cadaver underwent spiral CT* to evaluate a suspected spinal lesion and to provide CT anatomical data for comparison with gross anatomy and external landmarks (see below).

The anatomical sections were compared with levels predetermined to coincide with CT slices to determine key areas of anatomical overlap.

The cadaver was frozen and later sectioned using a band saw. Ten 10cm thick sections were made at levels predetermined to coincide with CT slices to determine key areas of anatomical overlap.

The sections consisted almost entirely of muscle. The caudal vein and artery, completely surrounded by the cartilaginous haemal arch, were further protected by cartilage in the ventral midline supporting the tail fin. The latter accounts for vascular access difficulties.

• The body cavity extended to the level of the pelvic fins, between which the cloaca was seen as a faint fat opacity. Caudal to this point the body cavity extended ventrally along the left side of the abdomen, whereas the right lobe spiralled from right to left, terminating just cranial to the tip of the left lobe. The liver had a low radiopacity on CT due to its function as a storage organ for fat in the form of oil.

• The stomach was a long vacuolar organ, occupying the second quarter of the shark’s length. It was traced on CT by virtue of its luminal gas. The gastro-oesophageal junction was level with the pectoral fins.

• The kidneys lay dorsally, enclosed by the epaxial muscles and bounded ventrally by the ureters / urinary vesicles. They extended from the level of the dorsal fin to that of the pelvic fins. They were discernible on CT by virtue of their fat content and thus slightly lower radiopacity than the surrounding muscle.

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• The spinal cord was a narrow strap-like organ. Its soft tissue opacity was poorly visible on CT.

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• The vertebral body was less dense than the ribs, which were denser than the cartilage in the ventral midline supporting the tail fin. The latter accounts for vascular access difficulties.

Learning outcomes

• The heart was a relatively small organ surrounded by a pocket of fat. It was enclosed ventrally by the sternum and dorsally by the caudal part of the basihyal (tongue).

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