

7. Summary

Ultrasound examination of the abdomen in rabbits

The study presented includes the following topics: Performance of abdominal ultrasonography, suitability of different transducers, normal sonographic anatomy of the rabbit's abdomen, sonographic evaluation of altered abdominal organs and value of sonography in the diagnosis of abdominal diseases in rabbits.

3 transducers were compared concerning their suitability for abdominal ultrasonography in rabbits:

A 5 MHz linear array probe (Pie Medical Scanner 480) was used to examine 61 rabbits weighing between 1.8 and 4.9 kg, 37 of them were bucks and 24 were does. 44 of the 61 rabbits were juvenile animals. According to case history, all 61 rabbits were healthy.

A 7.5 MHz sector probe (Esaote Biomedica Challenge / Caris) was used to examine 17 rabbits weighing between 1.4 and 4.1 kg, 2 of them were bucks and 15 were does. These rabbits were all adult animals, presented as patients with different clinical symptoms.

A 10 MHz sector probe (Philips Orion) was used to examine 77 rabbits weighing between 0.82 and 5.0 kg, 27 of them were bucks and 50 of them were does. According to case history, 28 of these 77 rabbits were healthy, 49 were patients with clinical symptoms.

Due to their shape and their high resolution, the 7.5 MHz sector probe and the 10 MHz sector probe proved to be very suitable for abdominal ultrasonography in rabbits. The special shape of the 10 MHz sector probe (Philips Orion) was particularly advantageous due to its excellent resolution in the near field. For the description of normal sonographic anatomy of the abdomen and for the comparison with the findings in diseased animals, only the ultrasound scans with this 10 MHz probe were evaluated, in order to obtain comparable results for all examined rabbits.

To evaluate the state of health of the rabbits, they were examined with well-established diagnostic methods (case history, clinical examination, blood tests and X-ray examination) before the ultrasound scan. Given the opportunity, an autopsy or a pathohistological examination of removed organs was performed afterwards.

During the ultrasound scans, the non-sedated rabbits were put in supine position on the lap of a helping person. The following normal organs could be imaged and evaluated with the 10 MHz sector probe: liver and kidneys in 100% of the animals, gall bladder in 80%, urinary bladder in 76%, parts of the gastric wall in 67%, spleen in 64%, parts of the intestinal walls in 62% of the animals, uterus in 67% of the does, left ovary in 42% and right ovary in 11% of the does. The urinary bladder and the normal uterus could only be visualized when the bladder was well filled, the right ovary could only be imaged in does with enlarged uterus.

For each of the organs mentioned above, the following aspects were examined: the most favourable position for scanning, disruptive and beneficial factors for imaging and normal sonographic findings (shape, surface and demarcation, internal architecture, echogenicity and in hollow organs also wall and contents). Gall bladder, spleen, gastric and intestinal wall, kidneys, urinary bladder wall, uterus and ovaries were also measured sonographically. The descriptions of these normal findings were completed by photos and drawings of the corresponding ultrasound pictures.

These findings in normal organs were compared with the findings in altered organs. Concerning kidney size, urinary bladder wall thickness and uterine diameter, also the measurements of normal and altered organs were compared.

In case studies, selected patients were presented in form of an overview of symptoms, results of blood tests and X-ray examination, results of ultrasonography and confirmation of these results (for example by histopathology). The following alterations of abdominal organs were described: hepatitis, nodular hepatic hyperplasia, follicular splenomegaly, uremic gastritis, intestinal tumor (suspicion), nephritis (interstitial nephritis, glomerulonephritis, chronic (pyelo-)nephritis with calcification of the cortex), calcification of the renal pelvis and renal calculi, cystitis, polyp / tumor of the bladder wall (suspicion), bladder sediment, sludge and stones, ovarian cyst, periovarian cysts and cysts in the serosa, (cystic) endometrial hyperplasia, uterine adenocarcinoma, hydrometra, pregnancy (from day 11) and postpartum uterus, free abdominal fluid (caused by cachexia or carcinomatosis) and peritonitis with intraabdominal abscesses. These case studies were completed by photos and drawings of selected ultrasound pictures.

In the concluding discussion of results, working out the value of ultrasonography in the diagnosis of abdominal diseases was of special importance. For this purpose, the results of ultrasonography were compared with the results of case history, blood tests and X-ray examination, and the possibilities and limits of ultrasound diagnosis in rabbits were discussed.

Ultrasound proved to be especially useful for the diagnosis of kidney, urinary bladder and female reproductive tract diseases, which are particularly common in rabbits. Furthermore, ultrasound was the only promising examination procedure in rabbits with free abdominal fluid and / or alterations of the peritoneum. Ultrasonography of liver, spleen and gastrointestinal tract did turn out to be problematic and unsure, but in some cases it proved to be a useful part of diagnostic workup nevertheless.