Instrumental diagnostic methods applied for orchiectomy in cockerels

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Abstract. Any common surgical procedure, including orchiectomy in cockerels, requires perfect knowledge in topography and syntopy of the organ the surgery is performed on. This also implies acquiring the necessary information via the application of a number of instrumental methods such as diagnostic roentgenography and diagnostic sonography. Both methods have positive (intravital, painless and quick procedure) as well as negative (possible flaws in diagnostics due to age peculiarities) aspects.

1 Introduction

Any surgical intrusion into the organism of an animal has to be flawlessly performed, which requires subspecialization and knowledge of species and age peculiarities in the topography and syntopy of the treated organs and, hence, can ultimately guarantee a successful procedure. As of yet, the data available on the age peculiarities of skeletopy of the domestic fowl classified as Dominant CZ hybrids is incomplete; therefore, the research is focused on the intravital diagnostics of the genital glands of cockerels as such that is mandatory before the surgical procedure as well as on the comparison of the obtained results and the data from the alternative researches.

2 Experimental

The research was carried out in the Center of Innovative Veterinary Medicine on the premises of the Federal State Budgetary Educational Institution of Higher Education "Belgorod State Agricultural University named after V. Gorin". The study was performed on the 120-, 90- and 60-day-old Barred D 959 cockerels. The two complementary intravital diagnostic methods included diagnostic roentgenography and diagnostic sonography. The images were described according to the NAV (The Nomina Anatomica Veterinaria) standards [1]. The Federal State Budgetary Educational Institution of Higher Education "Belgorod State Agricultural University named after V. Gorin" is licensed to work with the sources of ionizing radiation according to Part 2, Article 12 of the federal law "On Licensing Certain Types of Activities". The roentgenography room in the Center of Innovative Veterinary Medicine of the Federal State Budgetary Educational Institution of Higher Education "Belgorod State Agricultural University named after V. Gorin" is certified by the Sanitary and Epidemiological Service to work with the sources of ionizing radiation (Toshiba D-124 X-ray tube, DIG-360 X-ray) and provides conditions corresponding to the state sanitary and epidemiological standards under Sanitary Regulations 2.6.2612-10 "Basic Sanitary Rules for Radiation Safety". The roentgenography was carried out under the following conditions: current strength – 320 milliamps, tube voltage – 45 kilovolts, focal range – 105cm [2], intensity – 65 kilovolts.

The roentgenography was performed in the anteroposterior view. The lumbar of the bird was placed in the center of the X-ray film packet, and the body axis was sprawled along the film. Since making a quality image requires complete immobility of the patient, the manipulations were carried out by two professional veterinarians.

Before the diagnostic procedures, the fowl with no detected abnormalities was weighed on the electronic scales, which allowed for the precise calculation of the radiopaque amount. To enhance the X-ray absorption and visibility of blood vessels, visceral cavities and tissues, 300 mg of iodine omnipaque were used. The omnipaque was injected via IV push, 2 ml per 1 kg.

The sonography was carried out on the SIUI 5300 Apogee ultrasound system equipped with four transducers: C6LC microconvex transducer, C3LC macroconvex transducer, P5FC sector transducer and L8LC linear transducer; the ultrasound transducer frequency equaled 4-5MHz. The ultrasound propagation media included bones, parenchymal organs, soft tissues and gas characterized by different acoustic impedance and echogenicity. Technically, the examination was carried out on the patients laid down on the backbone. While being scanned, the cockerels were kept relatively immobile, their indumentum having been partly removed. Prior to the examination, their skin was surface-treated with ethanol and the ultrasound gel was applied. When imaging, the examined testicle was placed in the focal zone.

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3 Results and discussion

According to different sources, surgeons have faced various complications doing orchiectomy in cockerels. The serious ones resulting in death of patients included hemorrhage due to major arteries and veins lesions as well as lesions in adjacent organs. Thus, orchiectomy in cockerels may result in lesion of the caudal air sac, the seventh rib fracture and development of the subcutaneous emphysema in the postoperative period [3]. The procedure allowed to study and describe the algorithm of the diagnostic roentgenography and sonography on cockerels of different ages. The applied methods allowed for the intravital painless diagnostics and for tracing the disposition of the testicles and the adjacent organs and major blood vessels as well as for the comparison of the obtained data and the data from alternative studies.

At the preparatory stage of the experiment, we analyzed the works by N. E. Shalduga (2011), E. N. Nazarenko (2008) and E. N. Kuz'mina (2011) and, hence, discovered gaps in the presented materials:

Surgical Caponizing of Cockerels by N. E. Shalduga lacks clarity in terms of differentiation of the topographic peculiarities of the cockerel reproductive organs based on age differences;

Morphofunctional Peculiarities of Reproductive Organs Among Hisex Brown Cockerels in the Post-Incubation Ontogenesis by E. N. Kuz'mina and Skeletopy of Cockerel Testicles and Major Blood Vessels by E. Y. Nazarenko and V. V. Degtjarjov focuses exclusively on the reproductive organs of Hisex Brown cockerels and do not contain any data on the anatomical peculiarities of D 959 cockerels.

The results of the intravital methods of diagnostics confirmed the data provided in the abovementioned studies. The testicles of 60-day-old cockerels are imaged on both sides of the spinal column adjacent to the cephalic renal lobe and approaching the sixth rib on the frontal side. The testicles are adjacent to the posterior vena cava, most likely, due to short mesentery. At the rear and lateral sides, the testicles are partly covered by intestine loops.

In the process of spermatogenesis, as reproductive organs grow, the testicles are adjacent to the walls of the major vessels: the ventral side is adjacent to the caudal vena cava and the dorsal side is adjacent to the thoracoabdominal aorta. The tail of the testicle is caudad to central or rear third of the cephalic renal lobe and may reach the external iliac vein [1,2,3]. 90-day-old D 959 cockerels have testicles adjacent to the frontal renal lobe and thoracic vertebral body; they reach the fifth rib in the cephalic position and are caudad to the lumbar vertebrae. At the rear and lateral sides, the testicles are partly covered by intestine loops.

According to E. N. Kuz'mina [4], in puberty cockerel testicles are mostly placed asymmetrically and, as a rule, are slightly ectopic to the right side. The left testicle is adjacent to the thoracic vertebral body in the cephalic position and is caudad to the segments of the lumbar vertebrae whereas the right testicle has only its tail adjacent to them. In relation to the spinal column, both testicles take askew position; their tails are closely positioned at the base of the lumbar vertebrae, its second segment, though there are variations showing ectopy towards the first and the third segments. The cephalic boundary of the testicles is either the fourth intercostal space or the cephalic edge of the fifth or the sixth rib. The caudal boundary of the testicles is at the medial margin of the iliac bone (at the bottom of the aitchbone body) and the second segment of the lumbar vertebrae.

The roentgenograms of 120-day-old D 959 cockerels show well-developed testicular arteries and veins. The testicles are much bigger in size in comparison to the three-month-old cockerels. They are placed between the fourth intercostal space and the second segment of the lumbar vertebrae. At the rear and lateral sides, the testicles are partly covered by intestine loops.

The sonography in 60-day-old cockerels proved to be ineffective, apparently due to yet underdeveloped testicles and the lay-over effect.

The testicles of 90-day-old cockerels were shaped as an elongated oval, had well-defined and smooth boundaries with homogeneous echotexture and were characterized by hyperechogenicity, which was defined as a norm. The length of the right testicle amounted to 0.9 cm and the width – to 0.39 cm. The length of the left testicle equaled 1.3 cm and its width equaled 0.5 cm. Neither the epididymides nor neoplasms were imaged.

The testicles of 120-day-old cockerels were beanlike, had well-defined and smooth boundaries and were characterized by homogeneous echotexture and hyperechogenicity, which was defined as a norm. The length of the right testicle amounted to 4.5 cm and the width amounted to 2.6 cm. The length of the left testicle equaled 4.61 cm and its width equaled 2.9 cm. Neither the epididymides nor neoplasms were imaged.

The abovementioned non-invasive examination methods were used as the complementary methods that together allowed to study the topography of the cockerel testicles, define their sizes, plan the surgery procedure and evaluate the possibility of various further complications. Roentgenographic examination and diagnostic sonography are two simple and timesaving procedures which allowed to define the optimal age for orchiectomy in cockerels. Defining the optimal age for orchiectomy in cockerels was based the following criteria: surgical procedure with minimal time input and minimal post-operative complications. The obtained data showed that the optimal age for orchiectomy in cockerels is 60 days.

In the course of the research, we arrived to the following conclusions:

Testicles of 120-day-old cockerels have well-developed blood vessels and significant size, which may lead to a failed surgery and post-operative complications.

Roentgenographic examination and diagnostic sonography allow to carry out intervital diagnostic examination.

Roentgenographic examination and diagnostic sonography put the surgeon into control of the whole process of the surgical procedure and its outcome.

As the transducer can only be applied to a limited area of the body surface and the indumentum hinders the process, sonography cannot be considered fully efficient.

If carried out as a complex examination, roentgenography and diagnostic sonography are complementary to each other.

Diagnostic sonography offers little information if the examination is carried out on cockerels under the age of 90 days of post-incubation ontogenesis.

The above instrumental methods are not sufficient for the thorough study of the species peculiarities in terms of topography and perfusion in D 959 cockerels.

4 Conclusion

The diagnostic imaging is an indispensable part of the complex examination which allows for the formation of a complete picture of the surgical procedure complexity within a short period of time and helps a surgeon to plan a surgical procedure, predict the risks and decide if the surgery has to be carried out urgently and, hence, have a critical insight into the procedure and perform the surgery adequately.

The market of veterinary equipment has a wide range of producers, models and software for roentgenography and diagnostic sonography. However, the quality of the equipment does not always guarantee acquisition of the precise data. Following the necessary stages of the examination, experience and knowledge of basic animal and bird anatomy greatly contribute to building the complete picture. The current study can be helpful for practicing veterinarians and students keen on studying common modern methods of diagnostics. Orchiectomy in cockerels allows producing meat in which the amino acid balance corresponds to that of a perfectly balanced animal protein that contains the optimal ratio of all the amino acids [5]; further research on this issue appears to be of great relevance due to the rapid development of the research and education centers engaged in quality and healthy food production.

References

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