VETERINARSKI ARHIV 75 (6), 531-540, 2005

Sialography in horse: technique and normal appearance

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DEHGHANI, S. N., M. TADJALLI, A. SEIFALI: Sialography in horse: technique and normal appearance. Vet. arhiv 75, 531-540, 2005.

ABSTRACT

The anatomy of horse salivary glands was studied on cadaver heads. The mandibular duct enters the oral cavity on the border of sublingual caruncle. The parotid gland duct enters the oral cavity on the cheek opposite the upper 4th premolar (3rd cheek tooth). Prior to applying sialography to live animals the techniques of catheterization, injection and radiography had to be carried out on cadaver heads. The techniques were subsequently applied to three live animals. The animals were anesthetized routinely and the mandibular and parotid ducts catheterized, and contrast medium was injected into each gland. Lateral radiographs were made immediately after the injection. The normal horse mandibular and parotid salivary glands as depicted on sialograms have a multilobular appearance in cadaver heads, but in live animals the outline of gland, main ducts and their smaller branches could be identified. The parotid duct leaves the deep surface of the rostral end of gland and courses along the border of the masseter muscle before it enters the mouth. The mean diameter of parotid duct was 3.9 ± 0.9 mm. The mandibular duct leaves the rostral end of the gland, its mean diameter being 3.6 ± 1.2 mm. In conclusion, sialography of mandibular and parotid salivary gland in horse is practical and helpful in diagnoses of pathological conditions of these glands and their ducts.

Key words: horse, sialography, mandibular salivary gland, parotid salivary gland

Introduction

Contrast radiography has been used in the diagnosis of salivary gland diseases in canines (HARVEY, 1969). The technique of sialography and its normal radiographic appearances in live cattle (DEHGHANI et al., 1994); in live sheep (DEHGHANI et al., 2000a); in live camel (DEHGHANI et al., 2000b), and in live goat (TADJALLI et al., 2002) has been described. Differential diagnoses of salivary gland pathological conditions include foreign bodies

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ISSN 0372-5480
Printed in Croatia

occasionally found in salivary duct, salivary calculi (sialoliths) causing obstruction. Inflammation and neoplasm of the salivary glands have been reported (JUBB et al. 1985) which are rare in all species but which have been reported in cattle, sheep, pigs, horses and cats. Sialoliths are reported in the donkey (DEHGHANI and TABATABAI, 1993). Congenital duct atresia, as well as salivary cysts in horse, have been reported (TALLEY et al., 1990; SADLER et al., 1999). However, we were unable to find any report on sialography in horse. The salivary glands of the horse, like those of other herbivores, are relatively large. The parotid gland is the largest salivary gland located chiefly in the space between the ramus of the mandible and the wing of atlas. Its length is about 20-25 cm, its average thickness is nearly 2 cm and it has a long quadrilateral outline. The gland belongs to the compound alveolar glands of the serous type. The mandibular gland is smaller than the parotid, It is long, narrow and curved and extends from the atlantal fossa to the basihyoid bone, the length of which is 20-25 cm and its thickness about 1 cm. This gland differs from the parotid in that it possesses serous mucous and mixed alveoli. In contrast to the other herbivores the horse does not have a monostomatic sublingual salivary gland. Because of the close relationship between the parotid gland, the guttural pouch, retropharyngeal and cranial cervical lymph nodes, and because of the clinical importance of the retromandibular fossa in the horse, diagnosis of disease conditions of the salivary glands are of prime importance. Conditions such as dental surgery, upper jaw fracture, lower jaw fracture and kicking may induce trauma to the salivary gland and salivary ducts. Tumours and osteomyelitis may cause pressure on the salivary gland or their ducts.

Therefore, the purpose of this study was to cannulate the duct of the mandibular and parotid salivary gland and, using retrograde injection of contrast medium, to arrive at a clinically useful sialography protocol. In the second phase these techniques were applied to healthy horses to allow description of the radiographic appearance of normal mandibular and parotid salivary glands and their accompanying ducts.

Materials and methods

Cadaver heads of three adult horses with a mass of about 350-400 kg were used to study the anatomy of the salivary glands, their ducts and duct entrance into the oral cavity. Subsequently, sialography of the salivary glands was performed.

Additionally, sialography was performed on three live, clinically healthy adult horses to assess the feasibility of the technique.

Anatomic study. The orifice through which the saliva of the glands enters the oral cavity was identified. The skin over each gland was incised, the fascia dissected, each gland carefully freed of surrounding tissue and the ducts isolated along the entire length until they reached the oral cavity. The salivary gland capsules were removed. The isolated glands were weighed and their length and width measured.

Sialography of the parotid gland

Cadaver study. The mouth was opened with a mouth gag. The parotid duct orifice was identified opposite the upper 4th molar tooth on both sides of the oral cavity. In order to be able to catheterize the duct special catheter was developed. A dog urinary catheter (Gauge: 10F, Length: 40 cm) with a guide wire was used for catheterization of the duct. About 5 cm of the catheter could be introduced into the duct and 20 ml of iodinated (Telebrix 38, 380 mg/ml, sodium and meglumine Ioxitalamate, Guerbert, France) water soluble contrast medium injected. Lateral radiographs were subsequently made with the cassette placed under the side, being evaluated and exposed from the opposite side of the head.

Live animal study. Three live horses with a mass of about 400 kg were sedated with 0.06 mg/kg Acetylpromazine (KELA Laboratories NV-Belgium) intravenously and anaesthetized with Na Thiopental (BIOCHEMIE GmbH, Vienna, Austria) 8 mg/kg for other surgical procedures. The mouth was opened by a mouth gag, the tongue grasped by an assistant, and pulled slightly towards the side that was not evaluated. The orifice of parotid duct was identified. Five centimetres of the above mentioned catheter was inserted into the parotid duct, followed by an injection of 20 ml of iodinated water soluble contrast medium. Immediately following the injection radiographs were made using the technique for the cadaver head study.

Sialography of the mandibular gland

Cadaver study. The cadaver heads were positioned. The duct orifice of the mandibular salivary gland could be identified on the border of the sublingual caruncle. An 18-gauge 20 cm rigid atraumatic catheter was used to catheterize the mandibular duct. The entire length of the catheter was inserted into the duct and 20 ml of the contrast medium injected. Radiographs were subsequently made using a similar technique.

Live animal sialography. The live horses used for the previous study were also used for mandibular sialography. The sublingual caruncle and mandibular gland orifice were identified. The entire length of the previously prepared catheter was inserted into the duct and 20 ml of contrast medium injected. Radiographs were subsequently made using similar techniques as used for cadaver study.

Results

The parotid glands are located on the caudal part of vertical ramus of the mandible and masseter muscle, ventral to the wing of the atlas vertebrae and attached to the base of the ear. Its ventral end is wider, covers the regional lymph node (Parotid L. N.) and is in contact with mandibular gland ventrally. The parotid duct, composed of several small branches, leaves the gland at the ventral and rostral surface, coursing along the ventral and rostral border of the masseter muscle, as it is located between the muscle and the facial

vein and artery. It enters the oral cavity opposite the upper 4th tooth (3rd molar). The mean wide part of the parotid gland was 4.45 ± 0.15 cm, mean length was 21.55 ± 0.75 cm and mean weight was 192.5 ± 3.3 gm. In survey radiographs of the parotid gland there was no demarcation of the gland (Fig. 1). After injection of contrast medium, the gland was visible and appeared as a lobulated structure caudal to the vertical ramus of mandible (Fig. 3). The sialograms clearly depicted the parotid duct in the centre of the gland and the associated smaller branches. Only the main duct could be identified outside of the gland. Average diameter of the parotid duct was 3.3 ± 0.5 mm. The mean width and length of parotid gland depicted on the sialograms was 4.4 ± 0.4 cm and 17.0 ± 4.0 cm in cadaver and 5.7 ± 0.8 cm and 20.7 ± 1.4 cm in live animals, respectively (Table. 1).

Table 1. Radiographic mandibular and parotid gland dimension and duct diameters in live and cadaver horse.

		N°	Length (cm)	Width (cm)	Diameter of duct (mm)
Mandibular	Cadaver	3	13.6 ± 1.1	3.2 ± 1.0	3.6 ± 1.1
	Live	3	14.3 ± 2.2	3.5 ± 0.3	3.6 ± 1.2
Parotid	Cadaver	3	17.0 ± 4.0	4.4 ± 0.4	3.0 ± 0.4
	Live	3	20.7 ± 1.4	5.7 ± 0.8	3.9 ± 0.9

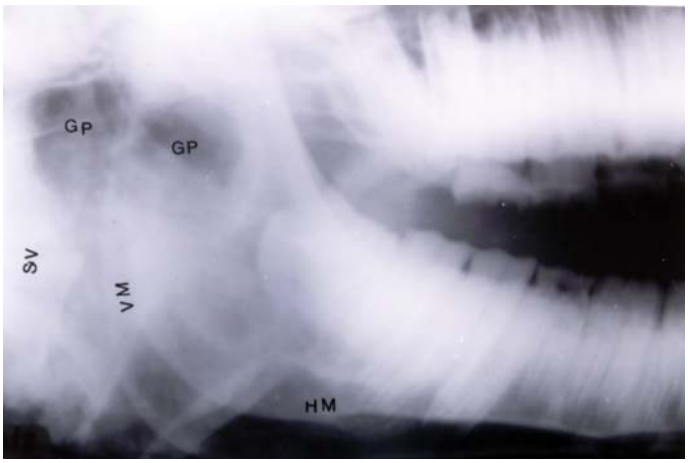

Fig. 1. Lateral plain radiograph of a horse cadaver head. None of the parotid or mandibular salivary glands are visible. Guttural pouch (GP), Vertical ramus of mandible (VM), Horizontal ramus of mandible (HM), Cervical vertebrae (SV).

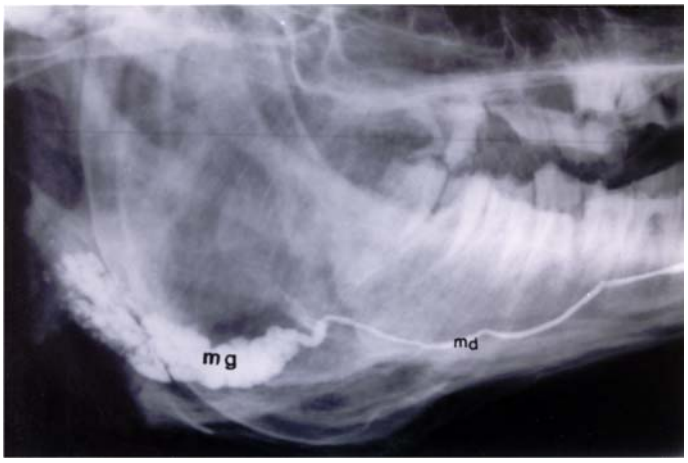

Fig. 2. Normal mandibular sialogram of a mature cadaver horse head. Mandibular Duct (md), Mandibular gland (mg).

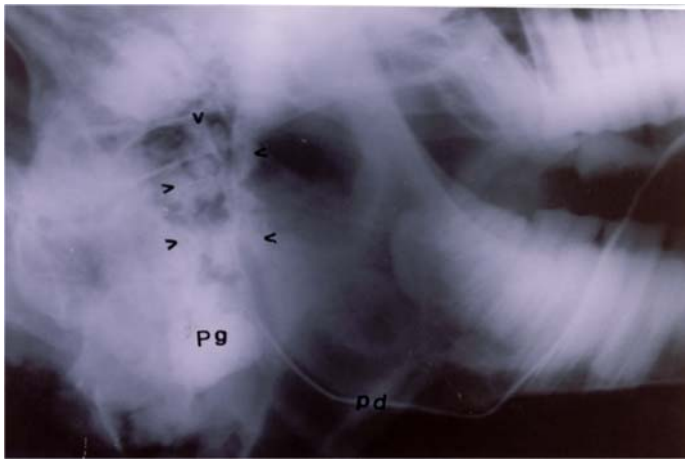

Fig. 3. Normal parotid sialogram in a mature cadaver horse head. Parotid duct (pd), Parotid gland (Pg). Note the lobulation of the entire gland (Arrow).

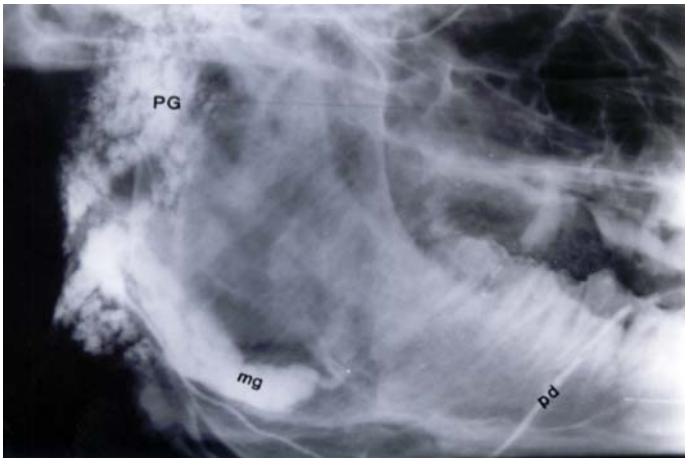

Fig. 4. Normal parotid (PG) and mandibular (mg) sialogram in a cadaver horse head. Both glands are over infused by contrast media to show the entire margins of each gland. The parotid duct (pd).

Fig. 5. Normal mandibular sialogram in a mature live horse. Mandibular duct (md) and mandibular gland (MG).

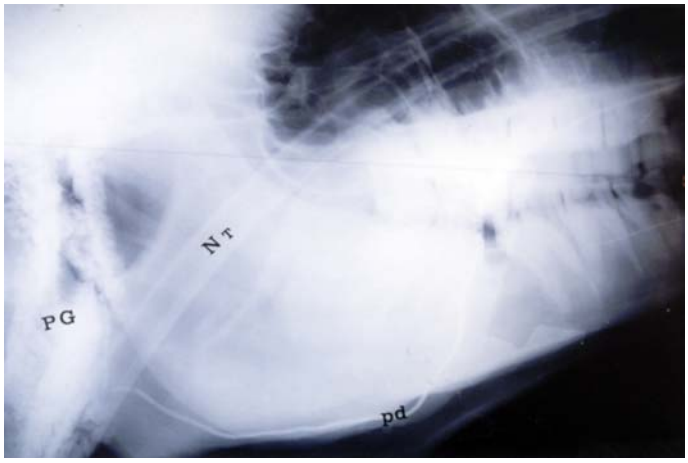

Fig. 6. Normal parotid sialogram of a live horse. The parotid duct (pd) and parotid gland (PG). Nasotracheal tube (Nt) under inhalation anaesthesia.

The common outline, gland lobules and smaller salivary duct branches could be identified in parotid sialograms in live horse as well as in cadaver study.(Figs. 3, 4 and 6).

The mandibular duct leaves the gland on the medial surface, passes over the cranial part of digastricus and styloglossus muscles, along the genioglossus muscle fibres to the sublingual caruncle. Several branches emerge from the main duct at the centre of the gland. The mandibular gland is in contact with the parotid gland dorsally (Fig. 4). The two mandibular glands are in close proximity rostrally. The mean mass, length and width of the gland is 47.9 ± 3.1 gm, 19.45 ± 0.4 cm and 2.67 ± 0.8 cm, respectively. The mandibular gland was not visible on the survey radiographs (Fig. 1).

On contrast radiographic studies, the mandibular gland could be clearly identified ventrally and caudally to the mandibular angle (Fig. 2). The gland has a multi-lobulated appearance. The duct first runs dorsally and then rostrally to the sublingual caruncle. The mean diameter of the duct on cadaver and live animal sialogram was almost similar (Table 1). The mean length and width of the gland depicted from cadaver sialogram was 13.6 ± 1.1 cm and 3.2 ± 1.0 cm, but in the live animal it was 14.3 ± 2.2 cm and 3.5 ± 0.3 cm, respectively. The appearance of the mandibular sialogram in live animals was similar to that in the cadaver study. The ducts and their smaller branches, as well as gland lobulations, could be identified (Figs 2 and 5).

Discussion

Increasing the amount of contrast medium to double the initial dose would be logical. Since proper doses of the water soluble iodinated contrast media were used for sialography, no adverse effect was found due to injection of the contrast media into any of the glands in this study, nor in other studies (DEHGHANI et al., 1994). If higher doses are used or injection is made under pressure, it may damage the parenchyma of the gland and possibly induce glandular fibrosis or atrophy (SUTTON, 1988). Sialography is an economical diagnostic procedure which provides an accurate view of salivary ducts within and outside of the parotid and mandibular salivary glands (O'BRIEN and BILLER, 1996). MRI is an expensive and frequently unavailable modality for the demonstration of these structures, and sonography is more suited to evaluation of the glandular tissue. Radiography will remain the most popular imaging modality in the near future for many reasons. It is economical, portable and familiar to large animal practitioners (NICKLE et al., 1979). In contrast, in this study it was apparent that the parotid gland was larger than the mandibular gland (192.5 ± 3.3 g as against 47.9 ± 3.1 g). In cattle, it was reported that the mandibular gland was the largest salivary gland (DEHGHANI et al., 1994). The mass of mandibular and parotid gland was reported to be 9.0 gm and 11.0 g, respectively, in sheep (GETTY, 1975). In another study the mass of mandibular and parotid gland in sheep was reported to be 16.2 ± 4.6 g and 13.5 ± 2.6 g, respectively (DEHGHANI et al., 2000a). In camel the mass of parotid and mandibular gland was reported to be 77.7 ± 16.9 gm. and 47.9 ± 9.1 g, respectively (DEHGHANI et al., 2000b). Gland mass would depend to a certain extent on the mass of the animal, where in this study the average mass of the horses was 453.0 ± 30.0 kg. Only lateral radiographs were made because ventrodorsal or dorsoventral radiographs would contain an excessive amount of superimposition of the osseous structures from the skull and mandible. The parotid duct orifice could be identified opposite the upper 4th tooth by its rosette shape. Catheterization of the parotid duct was possible in live animals after practicing on cadavers. By sedation and anesthetizing the animal, opening the mouth with a mouth gag, and a light source, the duct can be easily catheterized. The mandibular duct orifice is represented by an opening on the border of the sublingual caruncle. The cadaver study facilitated its identification. The differences between the parotid and mandibular gland dimension in sialographic and anatomic study could be due to the fact that the anatomic specimens were left flat on a table surface and measured. Sialography has been used for diagnosis of glandular rupture, inflammation, distention, necrosis, fistula formation, and for foreign bodies in the salivary gland of the dog and cat (HARVEY, 1969). Sialolith (7 × 4 cm) was reported in the parotid duct of a donkey (DEHGHANI and TABATABAI, 1993). The amount of contrast medium used to study the gland parenchyma, as well as the main duct and possibly its branches in cadaver and live animals, was about 20 ml. For better quality sialogram in live horses, the radiographic technique and normal glandular

appearance described in this paper can assist in the diagnosis of many different salivary gland diseases in horses.

Acknowledgments
The authors would like to express their thanks to Mr. Moslem Rezaei and to Nasrollah Golchine for their technical assistance in taking radiographs, and also to the Shiraz University for its generous support.

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Received: 9 September 2004
Accepted: 3 November 2005

DEHGHANI, S. N., M. TADJALLI, A. SEIFALI: Sijalografija u konja: postupak i normalan nalaz. Vet. arhiv 75, 531-540, 2005.

SAŽETAK

Anatomija slinovnica konja proučavana je na glavama lešina. Čeljusni slinovod ulazi u usnu šupljinu na granici podjezičnog uzdignuća, a zaušni slinovod ulazi u usnu šupljinu na obrazu suprotno od gornjeg četvrtog pretkutnjaka. Postupci kateterizacije, injekcije i radiografije uvježbani su na glavama lešina prije primjene sijalografije na živim životinjama. Postupak je potom primijenjen na trima živim životinjama. Životinje su bile podvrgnute rutinskoj anesteziji, a zatim su čeljusni i zaušni slinovodi bili kateterizirani te je kontrastno sredstvo bilo ubrizgano u svaku žlijezdu. Lateralna radiografija bila je učinjena neposredno nakon ubrizgavanja. Normalan izgled čeljusnih i zaušnih slinovnica na sijalogramima lešina bio je režnjate građe. Oblik žlijezde, glavni izvodni kanali i njihove manje grane mogli su se identificirati na živim životinjama. Zaušni slinovod napušta duboku površinu oralnog okrajka žlijezde i pruža se uz rub velikog žvačnog mišića prije ulaska u usnu šupljinu. Srednji promjer zaušnog slinovoda bio je 3,9 ± 0,9 mm. Čeljusni slinovod napušta oralni dio okrajka žlijezde, a njegov srednji promjer iznosi 3,6 ± 1,2 mm. Zaključno se može reći da je sijalografija čeljusne i zaušne slinovnice u konja od praktičnog značenja i korisna je u dijagnosticiranju njihovih patoloških stanja kao i patoloških stanja njihovih izvoda.

Ključne riječi: konj, sijalografija, čeljusna slinovnica, podušna slinovnica