CVJ CLUJ VETERINARY JOURNAL

Article

Clinical and radiologic diagnosis in dental disease in pet rabbits

Tamara Titanilla Kiss-Pruteanu[1*], Lucia Bel[1], Cosmina Dejescu[1], R. Lăcătuș[1], R.C. Purdoiu[1], Mariana Tătaru[1], S.M. Mârza[1], I. Papuc[1*]

[1] Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine, 400372, Cluj-Napoca, Romania; tmr_kss@yahoo.com, lucia.bel@usamvcluj.ro, cosminadejescu@yahoo.com, radu.lacatus@usamvcluj.ro, robert.purdoiu@usamvcluj.ro, mariana.tataru@usamvcluj.ro, sorin.marza@usamvcluj.ro, ionel.papuc@usamvcluj.ro

* Correspondence: ionel.papuc@usamvcluj.ro, tmr_kss@yahoo.com

Abstract: Rabbits became more and more popular pets these last few years. For assuring their good health and wellbeing both the owners and the veterinarians are equally responsible. Sudden change in diet or inadequate nutrients, poor husbandry or stressing factors can all cause complex systemic pathologies to appear that often start at the oral cavity and the teeth. The aim of this study was to identify and apply the most accurate methods of approach, restrain, examination and diagnosis in dental disease in pet rabbits. This study included 19 rabbits, one of them clinically healthy and 18 were identified with dental disease. The patients had multiple affections but we categorized them according to the primary disease. 6 of them presented with pathologies of the incisors (31.57%), 10 had issues starting with the premolars (52.63%) and 2 with the molars (10.52%). The highest rate was 52.63% represented by the ones that presented dental disease at the premolars. The most met pathology in this study was odontogenic abscess formation in 11 out of 19 cases (57.89%), in most cases the abscesses appeared secondary due to periodontal infections. Knowing the specific features of the oral cavity, of the approach and the restraining methods as well as the clinical and imagistic diagnosing can assure proper management of dental disease in pet rabbits.

Keywords: rabbits, dental disease, restraint, radiologic examination, management

1. Introduction

These days the domesticated rabbit (*Oryctolagus cuniculus*) is considered an excelent animal companion but at the same time they are also used as laboratory animals and also some specific breeds are raised in farms settings for meat production. Research in the last few years shows that in order to ensure the pet rabbits wellbeing and health they need to be committed for annual health checkups, to examine the whole body completed with a full clinical examination of the head and the oral cavity and the teeth [4, 5]. Knowing the specific morphology of the head, the mouth and the dentition of the rabbits is essential in the management of dental disease. Rabbits teeth are elodont (they grow throughout their entire life) and hypsodont (high-crowned teeth that exceeds the gum line) so they need to chew constantly for proper dental wear. The teeth, the periodontal ligaments and the bone structures are active tissues and they all change in relation to dietal changes, behavioral modification or environmental changes. Development of periodontal disease is plurifactorial and includes: genetic disorders, breed predisposition, traumatic events, defective treatment and neoplasia. Other morphological aspects that predispoze rabbits to development of dental disease are a narrow and elongated oral cavity and a massive tongue with evident

Received: 30.04.2024
Accepted: 24.06.2024
Published: 24.06.2024

DOI: 10.52331/9cv14n09

lingual protuberance. The upper lip of the lagomorphs is split, the diastema is long and they have heterodont dentition with hypselodont and lophodont cheek teeth. The enamel of the incisor teeth is white due to the lack of pigments. The occlusion of the cheek teeth is the anisognathus type what means that the lower jaw is narrower than the upper one. As a consequence of this type of jaw the occlusion changes during chewing and the grinding of the food only happens at one side at a time. During the mastication process the occlusion changes 120 times in a minute [15]. The rabbit's teeth are continuously growing throughout their entire life, the incisors grow approximately 2-2.5 mm/week and the cheek teeth 2.5-3 mm/month. Important factors that contribute to the normal ware of the teeth are time spent consuming food, type of the nutrients and the abrasiveness of the diet [12, 13]. Elodont teeth, as met in rabbits, have different anatomy and they are singular, homogenous elongated structures inside and outside the alveolus. The apex of the teeth remain largely open and they never form a "root" so they are considered aradicular. The germinative tissue represented by the pulp and the dental sac is positioned at the level of the apex and they continue to produce dental tissue from ameloblasts, odontoblasts and cementoblasts. There is a noticeable difference between the clinical and the reserve crown. The clinical crown is smaller and visible outside the alveolus while the reserve crown is the main structure of the teeth and is situated under the gum, intraosseous. Both of the crowns together form the long anatomical crown (*Corona anatomica*) or the body of the tooth (*Corpus dentis*) [1]. The dental formula is as follows: I (2/1), C (0/0), PM (3/2), M (3/3) = 28. The superior incisors have a specific placement in 2 rows: 2 well developed primary incisors followed by 2 secondary smaller ones. They have no canine teeth so the diastema is long. The premolars and the molars are placed in close proximity of the cheeks, the clinical crown is visible on the exterior of the gingiva and the reserve crown is situated under the gum line [9]. The mastication process begins with a vertical action of the incisor teeth, the edge of the lower incisors slide along the occlusal surface of the superior primary incisors. Once the food reaches the cheek teeth, the mandible proceeds with a lateral action of chewing. For this specific movement the mandible is first retracted from the initial position separating the incisors and aligning the molars. The temporomandibular joint acts as a pivot on the side that is currently active in chewing with the masseter and the pterygoid muscles activated only on one side at a time [17].

Dental disease in rabbits is divided in two big categories: hereditary and acquired. The most frequent hereditary dental diseases are prognatism and brevignatism especially in the dwarf breed pet rabbits due to genetic modification to obtain a more desired look which led to the shortening of the skull much like in brachycephalic dog breeds. A shorter nasal bone, abnormal curvature or shorter mandible can lead to elongated incisors and secondary excessive growth of the cheek teeth. Acquired dental disease is more frequent and there are also 2 big groups: traumatic and non-traumatic lesions. Traumatic acquired dental disease is caused usually by accidents and is represented by fractures of the teeth, the skull or contusion of the facial bones and structures that compromise the dental structures. Non-traumatic injuries often are caused by inadequate food, insufficient dental wear or periodontal infections. They can also be seen after thermal burns caused by faulty crown resection, calcium of vitamin D deficiency or neoplasia. Specific literature shows that the most common dental pathology in pet rabbits is odontogenic abscess formation [8, 10, 11].

2. Materials and Methods

In this study the biologic materials were represented by 19 pet rabbits, male and female, aged between 1 and 10 years of age that were submitted to the NAC (New Animal Companion) clinic of the Faculty of Veterinary Medicine, Cluj Napoca.

It is highly recommended that before the clinical examination, the patients need to be placed on the table in the transportation box and to be left there for a few minutes to get used to the smell, the lights, the voice of the veterinarian. The examination table has to be covered with a non-slippery material that is easily cleaned and disinfected, and if possible on top of that to place an absorbent mat, a towel or a blanket.

The non-biologic materials used in the study were represented by the TEMCO GRX radiography machine, classic stomatology instruments and specific ones used for rodents.

The applied work methods were represented by: approach of the patient and restraint followed by clinical examination which entailed: inspection, palpation, percussion, auscultation and thermometry, respecting all the semiological requirements [16]. The approach and the restraint of the pet rabbit has some specific features that differ from the ones used in farm animals. A very important part of the restraint is constant support of the spine and the lumbar area by fixing the hind limbs. The muscles of the posterior train are well developed and the brutal extension of the legs, the propulsion force or the twisting of the spine can cause luxation or even fracture of the vertebrae, lumbo-sacral fracture or fracture of the spine [6, 7]. If possible, it is recommended to avoid lifting the rabbits off the ground, but if it is necessary the best way is to support the body and fix the hind limbs with one hand while holding the sternum and supporting the chest with the other hand. For examining the head and the oral cavity, a towel can be used to wrap the patient in it. This towel or a blanket can be used also if the rabbit is very aggressive to lift it out of the transport container and then other different restraining methods can be applied (Fig. 1).

Fig. 1. Restraining methods for manipulation, lifting and transportation

When the burrito restraining method is used (Fig. 2), the rabbit is placed on the towel or blanket in sternal recumbency followed by covering the hind limbs and the back of the animal. The towel then is folded and fixed around the neck gently. This method enables the veterinarian to examine the head, the ears and the mouth of the rabbit. A big advantage is that oral medication can be also given during this restrain and the patient cannot move abruptly.

Fig. 2. Burrito restraining technique

Proper examination of the head is a very important step in the general clinical examination. When done correctly, it can provide essential information to establish a proper diagnosis.

Inspection from a distance is the first step of the examination of the head. We evaluate the symmetry of the face, abscesses appear usually only on one side of the mandible or the maxilla. Asymmetry of the face can also be caused by neurological diseases like facial nerve paralysis with ptosis of the eyelids or the lips. In most cases epiphora can be caused by elongated upper incisors or premolars and even wet dermatitis of the skin around the eye can be seen due to the constant irritation [9]. Fetid smell can guide the diagnostician to consider the existence of abscesses or other suppurative processes with bacterial involvement. In certain situations with dental disease or persistent pain, most of the rabbits have bruxism, presented by a grinding sound of the teeth that the practitioner can easily identify. Dental disease can induce lethargy, apathy, behavioral changes, lack of self-cleaning or changes of the appetite.

Palpation of the rabbit face needs to be done very cautiously due to the discomfort it causes. Often when evaluating the bone structures and palpating any present modifications the rabbits may react and retract but that is not always caused by the presence of pain. Uneven surface of the head, or any kind of asymmetry of the skull has to be properly investigated. The methodology of palpating the head (Fig. 3) is as follows: Initially we palpate the ventral and lateral surface of the mandible to check for any kind of formation of soft or hard tissue like abscesses, ossification processes, bone remodeling due to excessive growth of the lower cheek teeth; then we follow with palpation of the nasal bone and the maxilla to identify any dental disease associated with elongation of the upper teeth or odontogenic abscess formation. Palpation of the cheek area is not recommended before an inspection of the oral cavity due to the possible formation of dental spikes that cause discomfort and pain that interferes with the evaluation and the interpretation of the symptoms. Then we proceed with the palpation of the zone around the eyes, we evaluate symmetry and protrusion of the eye globes and the temporomandibular joint. In lop eared rabbits the external auditory canal has to be palpated in a descending direction after lifting of the earlobe.

Fig. 3. Palpation of the rabbit head

Examination of the oral cavity can be done using the classical stomatology tools, or the specialized ones developed for rabbits and small rodents (Fig. 4). The rabbit is often awake for this part of the exam but in cases where it is needed the patient can be under general anesthesia too. Because of the length and narrowness of the mouth, two types of speculums are needed when examining the patient under anesthesia: one for the cheeks and one for the mouth to keep it open. The instruments needed for the inspection of the oral cavity are: mouth gag, cheek dilator, cotton swabs, cheek spatula, otoscope, periodontal probe, dental mirror, hemostat, light source, pediatric laryngoscope and containers for biological samples.

Fig. 4. Instruments for examining the oral cavity of the rabbit

When not in use, the inferior incisors should be positioned between the first and the second row of the superior incisors (Fig. 5). The normal physiological shape of the incisors should be a chisel-shape. The labial surface of the incisors should be white and smooth to the touch, any modification of color, shape, roughness, or presence of horizontal ridges may indicate pathological processes.

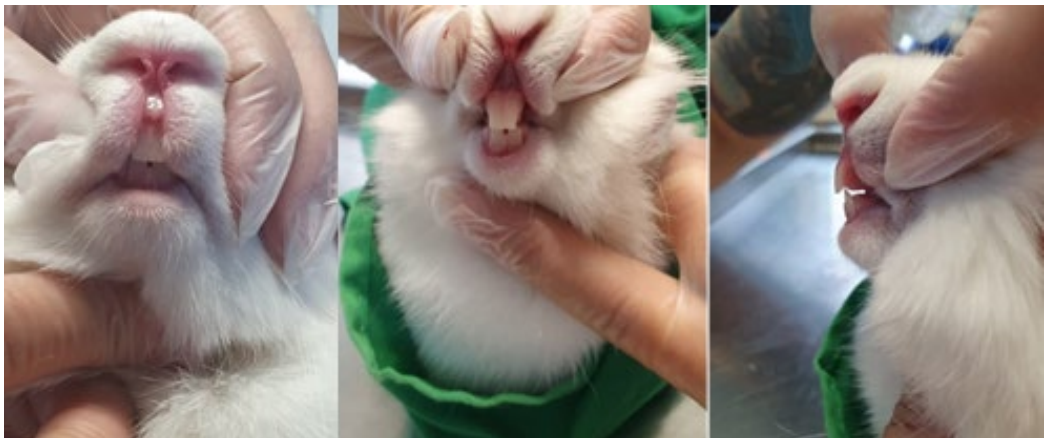


Fig. 5. Examination of the nose and occlusion of the incisors

For examining the inside of the mouth, the veterinarian with one hand fixes the head of the rabbit and lifts the upper lips while gently sliding the otoscope or the laryngoscope inside the mouth with the other hand (Fig. 6).

Fig. 6. Examining the oral cavity and the teeth with the otoscope or laryngoscope

Depending on the size of the rabbit, the lower cheek teeth have a short clinical crown while the superior premolars and molars are barely visible at the level of the gum line. The occlusal surface of the premolars and molars is at a 10° angle [19]. Any kind of modification needs to be identified like: changes in the angle of the occlusal surface, uneven surface, changes in the length of the clinical crown, dental spike formation, lesions of the surrounding soft tissue, ulcerations, excessive amount of saliva in the mouth, halitosis, absence of teeth, high dental mobility, presence of purulent material or hemorrhage. Often is needed to clean the mouth using a cotton swab before trying to examine the oral cavity because food and other kind of substances can remain stuck between the teeth and the mucosa or tongue [14].

Performing radiological imaging is recommended when during the clinical examination certain modifications are found like: deformity of the head, asymmetry of the skull, abscesses, malocclusion or metabolic diseases are suspected: osteodystrophy or secondary hyperparathyroidism. A high quality radiologic image can help the clinician to establish therapeutic protocol more efficiently and to elaborate a more precise prognosis. The most important aspect of obtaining a high quality image is based on the positioning of the patient on the radiology table. In rabbits when they are well restrained and docile an overall image can be made but usually it is recommended that the rabbits undergo general anesthesia or sedation at least. When the patient is weakened

anesthesia can carry unnecessary risks and it is not indicated until the patient is stabilized and well hydrated. A radiological examination usually consists of two exposures: one latero-lateral and one dorso-ventral but in most cases these are not satisfactory due to the superimposition of multiple tissue layers. Research shows that a minimum of 4 different exposures are needed to fully asses dental disease in rabbits, as shown in the 19th case included in this study on a clinically healthy rabbit (Fig. 7). The aforementioned two exposures need to be completed with an oblique exposure at 40° angle on each side to visualize the mandibles and the apex of the lower cheek teeth.

Fig. 7. Mandatory exposure of the head, case 19:
A-latero-lateral; B-dorso-ventral; C-oblique-right ; D-oblique-left

Out of these 4 exposures, the most relevant information can be obtained when the patient is positioned correctly on the latero-lateral one, to apply the reference line system developed by Bohmer and Crossley [3]. On the latero-lateral view (Fig. 8 A) in rabbits' normal occlusion, there should be no dental structures outside the line that connects the proximal extremity of the nasal bone to the occipital protuberance. Another reference line parallel with the dorsal line connects the rostral extremity of the hard palate to the tympanic bulla at 1/3 of its height. This second line marks the occlusal surface of the cheek teeth. Although there are 6 upper cheek teeth and only 5 lower ones, the length of the occlusal surfaces is roughly the same. In healthy rabbits, the apexes of the lower cheek teeth should not penetrate the osseous ventral lamina of the mandible. The jaw should have a constant width and homogenous structure at the level of the lower premolars. In the dorso-ventral exposure (Fig. 8 B) a series of reference lines can be traced starting with 2 lines that connect the lateral limit of the superior incisors down to the median angle of the mandible on the same side. Another set of symmetrical lines connect the lateral limit of the tympanic bulla to the lateral extremity of the incisor on the opposing side. No other dental structures should be visible in the areas traced by these set of lines except for the apexes of the superior premolars that normally have a curved shape [2].

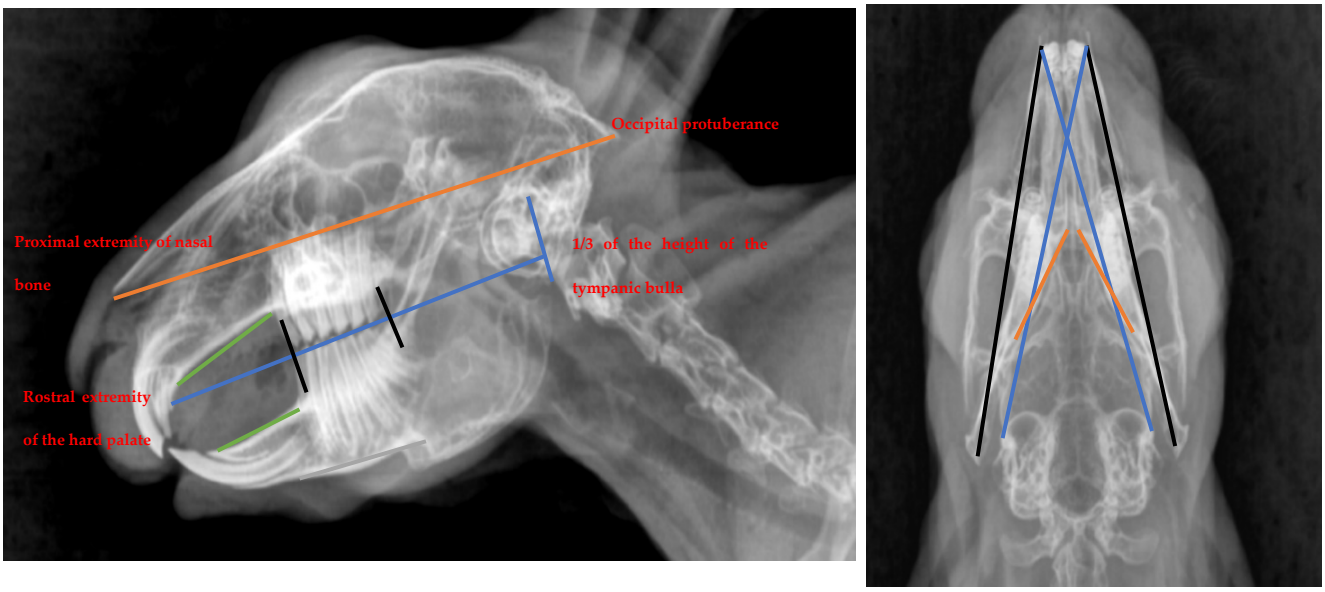


Fig. 8. Reference lines on the radiologic image: A- latero-lateral exposure; B- dorso-ventral exposure

3. Results

In this study were included 19 rabbits, 1 of them (5.26%) was clinically healthy, and 18 were diagnosed with dental disease. 6 of the rabbits had primary dental disease at the level of the incisors (31.57%), 10 of them had problems with the premolars (52.63%) and 2 presented pathology in the molars (10.52%). The highest percentage was represented by 52.63% with diseases of the premolar cheek teeth (Fig. 9). The classification criteria was based on the type of teeth that initiated the development of the dental disease. Each of the cases except for the healthy one, presented multiple disorders, primary and secondary modifications as well. The most frequently identified pathology in this study was odontogenic abscess formation in 11 of the 19 cases (57.89%). Most of these abscesses developed secondarily to periodontal infections.

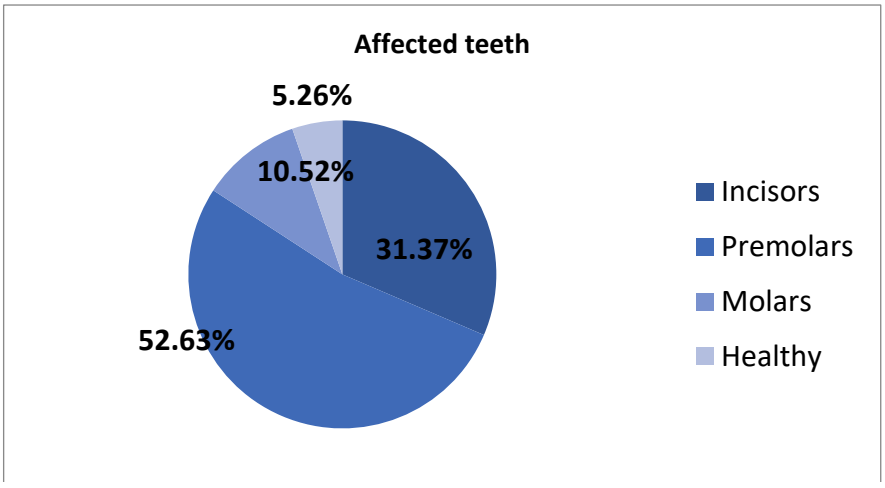


Fig. 9. Classification of dental pathology (%) based on the type of the teeth primarily affected

4. Discussion

The cases included in this study were classified in two big categories: hereditary dental disease, like prognathism, and acquired dental disease like traumatic lesions, abscess formation, malocclusion, or metabolic bone disease. We had 2 cases identified with congenital dental disease: cases 1 and 2. Case 1, female, 1 year old, diagnosed with prognathism with extreme curvature of the superior incisors. In this case resection of the clinical crown of all the incisors was used to try to correct the malocclusion (Fig. 10 A). The second case was represented by a male rabbit, 6 months old, also with prognathism but also a secondary elongation of the premolars both superior and inferior and osteodystrophy of the upper primary incisors (Fig. 10 B). The rabbit underwent surgery to resect the crowns of the incisors close to the gum, to shorten the clinical crown of the cheek teeth to correct occlusion. After 6 months, he still presented malocclusion of the incisors, but the occlusal surface of the cheek teeth was improved (Fig. 10 C).

Fig. 10. A- Maxillary prognathism, case 1; B- Maxillary prognathism with osteodystrophy of the upper incisors, case 2; C-. 6 months after crown height reduction, case 2

We diagnosed 16 cases of acquired dental disease out of the 19 cases. They will be presented here based on the type of the teeth that started the pathological process. Cases 3, 4, 5 and 13 presented with primary acquired dental disease of the incisors. Case 3, male, 4 years old, suffered from fractured superior incisor due to some level of metabolic bone disease expressed by osteolysis and odontogenic abscess formation at the first lower premolar (Fig. 11 A). Surgical treatment concluded extraction of the upper incisors and the first two lower premolars on the left side, then followed by marsupialization of the abscess. Both cases 4 and 5 were identified with odontogenic abscesses at the inferior incisors. Case 4, female, 1 year old, presenting jaw abscess with the starting point at the right inferior incisor (Fig. 11 B). The abscess was marsupialized and the affected incisor was extracted. Case 5, male, 8 years old, presented with abscess at the mandible due to periodontal infection of the lower incisors (Fig. 11 C). In this case both of the inferior incisors were extracted and then proceeded to the marsupialization of the abscess. Case 13, male, 2 years old, diagnosed with apical elongation of the inferior incisor that pushed the first lower premolar and dislocated it and then led to abscess formation because the osseous lamina of the mandible was injured (Fig. 11 D).

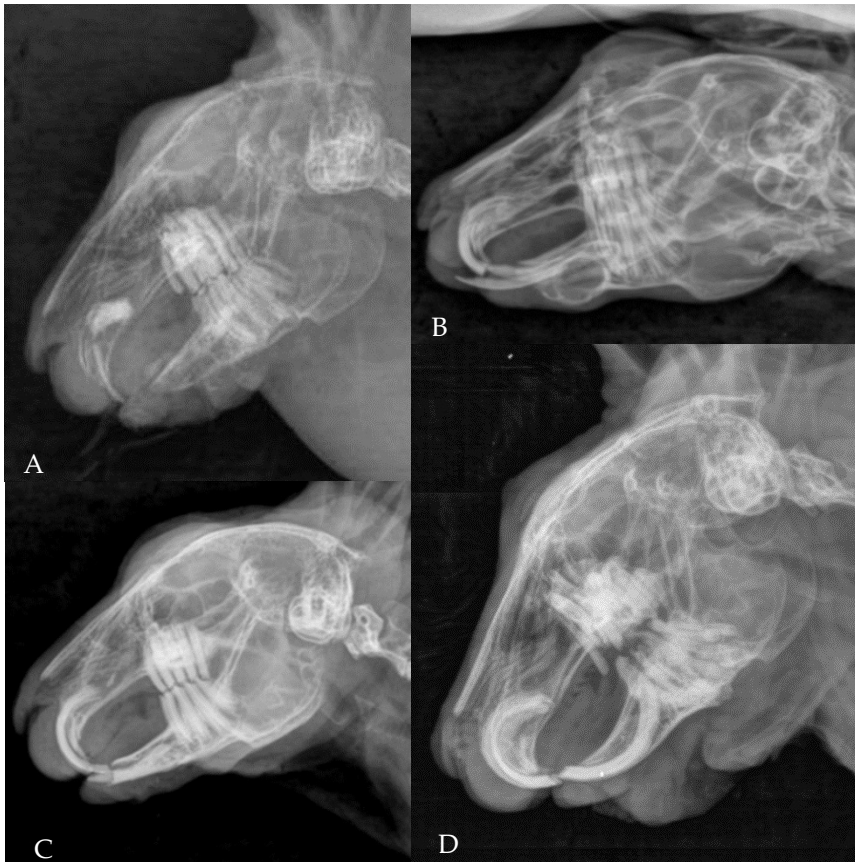
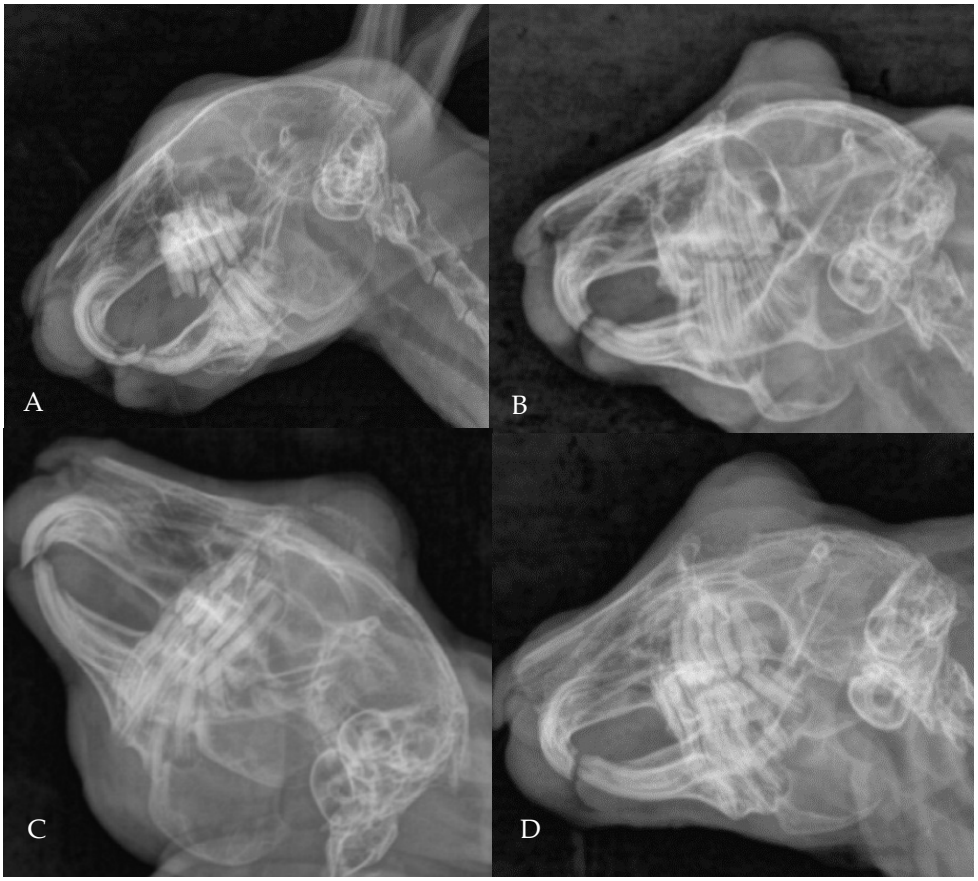


Fig. 11. A- Fractured superior incisor, case 3; B- Mandibular abscess at the right lower incisor, case 4; C- Periodontal infection of the lower incisors with abscess formation, case 5; D- severe malocclusion and mandibular abscess with elongation of the lower incisors, case 13

The premolars were the most frequently affected teeth in this study and their pathology included: crown elongation, odontogenic abscess formation, in some cases also secondary malocclusion of the incisors. Dental disease of the premolars usually appear due to insufficient wear most likely caused by inappropriate nutrition. Cases 6, 7, 9 and 10 were all identified with excessive growth of the premolars which later led to complications. Case 6, male, 3 years old, had elongated premolars with bone remodeling of the mandible which then caused secondary malocclusion of the incisors with exaggerated curvature and overgrowth (Fig. 12 A). We resorted to crown reduction of the incisors to the gum line, and also reduced the crown of the upper cheek teeth. The inferior premolars were extracted. Case 7, male, 2 years old, presented with slight malocclusion of the incisors due to overgrown cheek teeth (Fig. 12 B). Under general anesthesia the clinical crown of the incisors and the cheek teeth were shortened to give back a more natural occlusion. Crown elongation of the superior and the inferior molars in Case 9, male, 3 years old, condition a non-physiological positioning of the inferior molars and remodeling of the mandible (Fig. 12 C). The overgrown premolars were extracted. Case 10, female, 3 years old, elongated premolars led to penetration of the osseous lamina of the mandible and osteolysis. In this case too, the premolars were surgically extracted.



O

Fig. 12. A- severe malocclusion, case 6; B- Slight malocclusion of the incisors due to overgrown premolars, case 7; C- Crown elongation of the premolars and bone remodeling, case 9; D- Overgrown inferior premolars causing remodeling and osteolysis, case 10

Out of all the diagnosed non-traumatic acquired dental disease most of the cases were represented by odontogenic abscess formation based on gum inflammation and periodontal infections. Cases 8, 11, 12, 14, 15 and 16 all were identified with abscesses originated at the level of the premolars and later presented complications like tooth fracture, osteolytic leasions and severe bone remodeling. Case 8, male, 5 years old, presented with fracture of the first inferior premolar, secondary malocclusion of the incisors, remodeling of the mandible and apical abscess that involved also the lower incisors. The maxillary incisors were reduced, and both lower incisors were extracted along with the fractured premolar (Fig. 13 A). Case 11, 3 years old male, with severe acquired dental disease. Presented with excessive growth of the mandibular cheek teeth, especially the premolars, with heavy mandibular bone remodeling that lead to abscess formation and secondary malocclusion of all the incisors. The incisors were resected with a dental burr using a diamond disc, the mandibular incisors on the left side were all extracted and the abscess was marsupialized (Fig. 13 B). Case 12, male, 1 year old, presented with a mandibular abscess that started at the apex of the first lower left premolar. The capsule of the abscess presented severe ossification, the superior premolars also were elongated and the lower molars presented pathological curvature of the reserve crown. Surgical treatment involved marsupialization of the abscess together with resection of the capsule, extraction of the affected premolar and leveling the occlusal surface of the cheek teeth with the help of the dental burr (Fig. 13 C).

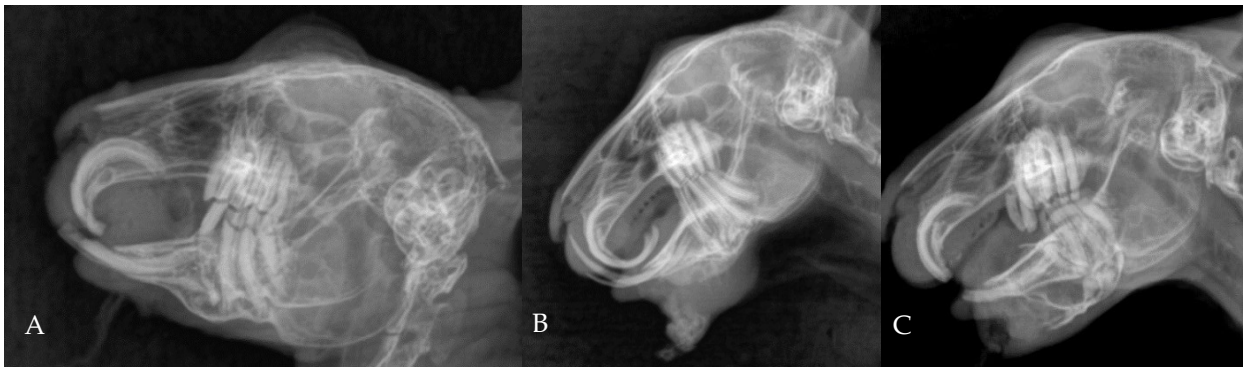


Fig. 13. A- Fracture of the first mandibular premolar and secondary malocclusion of the incisors, case 8; B- Mandibular abscess and secondary malocclusion of the incisors, case 11; C- Mandibular abscess of the mandible with ossified capsule and severe malocclusion, case 12

Cases 14, 15 and 16 also presented with mandibular abscesses with various etiology. Case 14, 1 year old male, diagnosed with abscess formation on the mandible due to periapical infection of the lower premolars on the left side with severe ossification of the abscess capsule and bone remodeling (Fig. 14 A). The affected premolars were extracted and the abscess was marsupialized after removing as much as possible of the capsule tissue. Case 15, male, 1 year old, diagnosed with dystrophy of the first lower premolar of the left side that caused lateral mandibular abscess formation due to the periapical infection. The abscess was drained and the affected premolar was extracted (Fig. 14 B). Case 16, male, 7 years old, presented with abscesses both on the mandible and the maxilla, due to chronic periapical infections of the premolars. The abscess capsule was completely ossified on the mandible (Fig. 14 C). The patient was euthanized as requested by the owner.

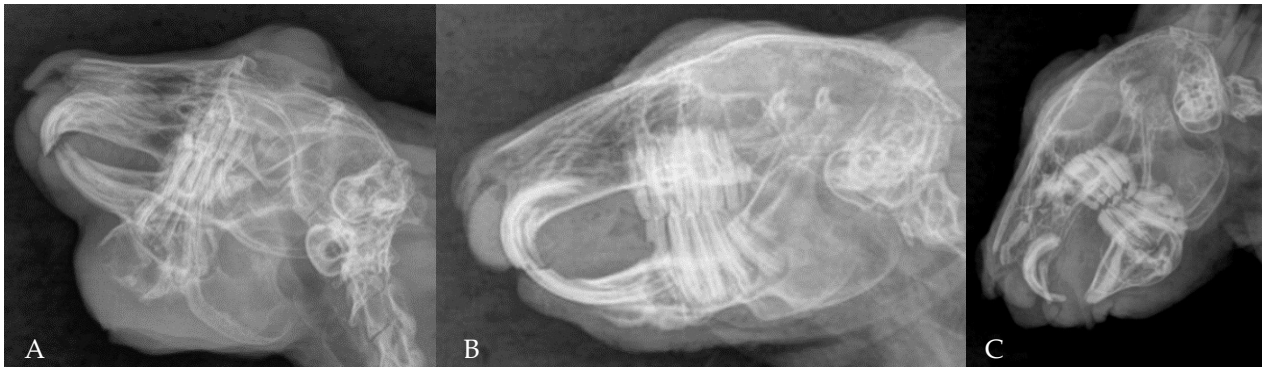


Fig. 14. Odontogenic abscess formation: A- Premolars left side of the mandible, case 14; B- First left lower premolar, case 15; C- Severe acquired dental disease with ossified abscess capsule, case 16

Primary pathology of the molars is quite rare, but in this study were included 2 of them presenting crown elongation and abscess formation: cases 17 and 18. Case 17, male, 2 years old, diagnosed with odontogenic mandibular abscess and elongation of the cheek teeth both superior and inferior (Fig. 15 A). Treatment involved surgical marsupialization of the abscess and crown reduction of the molars. Case 18, male, 3 years old, presented with caudal dislocation of the last lower molar and dystrophy of the tooth structure. In this case surgery was not

recommended, the owner was advised to improve the diet and add rough nutrients that help with dental wear (Fig. 15 B).

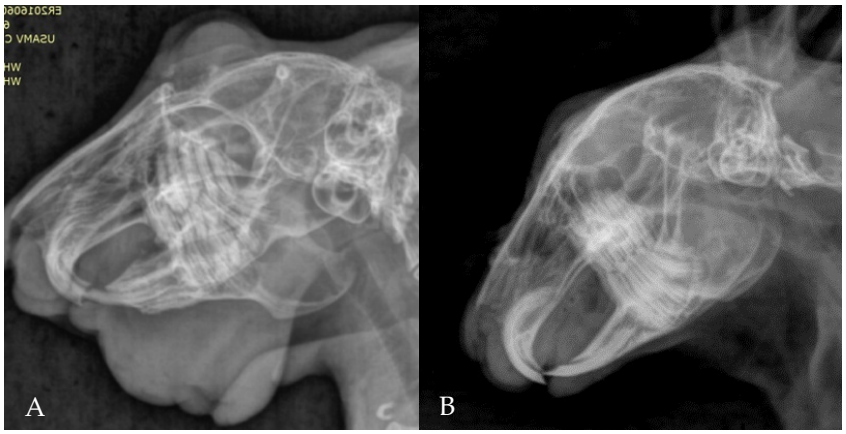


Fig. 15. A- severe elongation of the mandibular molars and abscess formation, case 17; B- Dystrophy of the dental structure of the last inferior molar, case 18

5. Conclusions

In our study after quantitative evaluation of the described dental pathology of rabbits, the results are similar to results obtained in the specific literature, which shows that the most affected teeth are the inferior premolars (43.33%). Using the reference lines as a method of interpretation the radiological images offers a better understanding and a higher chance of proper diagnosing of dental pathology in rabbits. Radiological examination in suspected dental disease is a gold standard method in identifying the primary pathology in stomatological disorders and it also aids in following up on the healing process as needed.

Author Contributions: Conceptualization, K-P.T.T. and I.P.; methodology, investigation, L.R., P.R.C. and M.S.M.; writing—original draft preparation, K-P.T.T.; writing—review and editing, M.T., L.B. and C.D.; supervision, I.P.; All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: Ethical review and approval were waived for this study due to preexisting conditions in the dogs, which included recommended euthanasia based on previously obtained consent from the owners.

Data Availability Statement: For further information, please contact the corresponding author via email.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Böhmer Estella, (2015). Dentistry in rabbits and rodents. John Wiley & Sons, pg. 5-20.
2. Böhmer, C., Böhmer, Estella, (2017). Shape variation in the cranio-mandibular system and prevalence of dental problems in domestic rabbits: a case study in Evolutionary Veterinary Science. Veterinary sciences, 4(1):5.
3. Böhmer, E.; Crossley, D., (2011). Objective interpretation of dental disease in rabbits, guinea pigs and chinchillas. Eur. J. Comp. Anim. Pract., 21:47–56.
4. Capello, V., (2006). Surgical treatment of dental-related abscesses in pet rabbits. In Proceedings of the North American Veterinary Conference. Orlando, FL: NAVC pg. 1703-1706.

5. Crossley, D.A., Aiken, S., (2004). Small mammal dentistry. In: Ferrets, Rabbits and Rodents. Clinical Medicine and Surgery (eds Quesenberry, K.E. & Carpenter, J.W.), pg. 370−82. Saunders, Philadelphia, Pennsylvania.
6. Fisher, P. G., (2010). Standards of care in the 21st century: the rabbit. Journal of Exotic Pet Medicine 19:22-35.
7. Flecknell , P., (1983). Restraint, anaesthesia and treatment of children's pets. In Practice 5:85-95.
8. Glöckner, B., (2002). Aetiology and therapy of diseases of teeth and jaw of pet rabbits (Doctoral dissertation, PhD thesis. Freie Universität Berlin Germany. (In German)).
9. Harcourt-Brown, F., Chitty, J., (2013). BSAVA manual of rabbit surgery, dentistry and imaging. BSAVA manual of rabbit surgery, dentistry and imaging.
10. Harcourt-Brown, F.M., (1995). A review of clinical conditions in pet rabbits associated with their teeth. The Veterinary Record, 137(14):341-346.
11. Jekl, V., Hauptman, K., Knotek, Z., (2008). Quantitative and qualitative assessments of intraoral lesions in 180 small herbivorous mammals. Vet. Rec.,162:442−449.
12. Lord, B., (2011). Dental disease in the rabbit Part 1: normal dentition and diet. Companion Animal, 16(5):53-55.
13. Lord, B., (2011). Dental disease in the rabbit Part 2: Dental disease causes, clinical signs and diagnosis. UK Vet Companion Animal, 16(6):39-42.
14. Meredith, Anna, Brigitte Lord., (2014). BSAVA manual of rabbit medicine. British Small Animal Veterinary Association.
15. O'Malley, B. ed., (2005). Clinical anatomy and physiology of exotic species, WB Saunders Company, pg. 190.
16. Papuc, I., 2017. Tratat de semiologie medicală veterinară. Editura Academiei Române.
17. Quesenberry, K.E., Carpenter, J.W., (2012). Ferrerts, Rabbits and Rodents. Clinical Medicine and Surgery, Third Edition. New York. Elsevier Saunders, pg. 433-456.
18. Verhaert L., (2004). Dental diseases in lagomorphs and rodents. In: Gorrel C. (editor). Veterinary Dentistry for the General Practitioner. Elsevier Health Science, Edingburgh, pg. 175-196.
19. Verstraete, F.J., Osofsky, A., (2005). Dentistry in pet rabbits. Compendium, 27(9):671-84.