

## SOME PERSONALIZED APPROACHES CONCERNING THE ABSENCE OF A TOOTH ON THE DENTAL ARCHES IN YOUNGSTER DOGS AND CATS: CASE REPORT SERIES

### CÂTEVA ABORDĂRI PERSONALIZATE PRIVIND ABSENȚA UNUI DINTE DE PE ARCADELE DENTARE LA CÂINI ȘI PISICI DE VÂRSTĂ TÂNĂRĂ: SERIE DE RAPORT DE CAZ

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#### ABSTRACT | REZUMAT

Dental eruption in cats and dogs ends by the age of seven months. By that age, dogs should have 42 teeth and cats 30. Any missing tooth from the dental arch should be radiologically investigated. This study aims to present a protocol for a clear diagnosis when the clinician is facing up a missing tooth on the dental arch in youngsters. Also, it aims to report a series of therapeutical approaches based upon the local situation, willingness of the owner and the experience of the doctor. Seven cases with different therapeutical approaches are presented. From pure bred dogs to mixed dogs, treatment may vary from taking no action, to removable dentures, dental bridges, dental implants, dentigerous cyst enucleation, or surgical extraction. The oral cavity's normal physiology has to be restored regardless of the cause. An adequate therapeutical approach will lead to long-lasting, favorable results. Untreated retained teeth may lead to dentigerous or oncologic complications. It is recommended that every dog or cat seen for vaccination or neutering, by the age of six months, to have all teeth identified and recorded. Any edentulous area needs to be radiologically examined. Early diagnosis will lead to fewer complications and less invasive maxillo-facial procedures.

**Keywords:** cats, dentistry, dogs, teeth, retained

Erupția dentară la câini și pisici se încheie la vârsta de șapte luni. Până la această vârstă, câini trebuie să prezinte 42 de dinți, iar pisicile 30. Orice dinte lipsă de pe arcada dentară trebuie investigat radiologic. Acest studiu vine să prezinte protocolul de diagnostic atunci când un clinician se află în fața unei lipse dentare pe arcadă, în cazul animalelor de companie de vârstă tânără. De asemenea, se dorește să se raporteze metode terapeutice adecvare situației locale, dorințelor proprietarilor, în relație directă cu experiența medicului. Indiferent că este vorba de câini de rasă sau metiși, tratamentul poate varia de la a nu face nimic, la proteze mobilizabile, punți dentare, implanturi dentare, enuclearea chistului dentiger sau extracție chirurgicală. Fiziologia cavității orale trebuie restaurată indiferent de cauză. O abordare terapeutică adecvată va duce la rezultate favorabile, de durată. Dinții incluși netratați vor duce la complicații oncologice sau de tipul chisturilor dentigere. Fiecărui câine sau fiecărei pisici care se prezintă pentru vaccinare sau sterilizare, după vârsta de șase luni, este recomandat să i se numere și să i se identifice dinții. Orice zonă edentată trebuie examinată radiologic. Un diagnostic pus cât mai devreme va duce la mai puține complicații în timp și la proceduri maxilo-faciale mai puțin invazive.

**Cuvinte cheie:** pisici, stomatologie, câini, dinți, inclus

Dogs' and cats' characteristics for dentition are diphyodont, heterodont, anelodont, brachydont, secodont, and bunodont. A diphyodont dentition has deciduous and permanent sets of teeth. If the teeth are morphologically different that they are named heterodont and when they have a limited period of growth, the specific term is anelodont. Secodont means that the teeth have sharp cutting edges, meanwhile bunodont is the term for prominent cusps (8). Deciduous eruption in dogs starts around three weeks of age and is complete around 40-50 days, with some variations depending on breed, sex, health, and other individual factors. Dogs' deciduous teeth are 28. The first permanent premolar and the molar teeth do not have prede-

cessors in deciduous dentition. The dental formula for deciduous dentition in dogs is:  $2x (I3/3; C1/1; PM3/3) = 28$ . Permanent dentition in dogs starts around three-four months of age, being complete by six-seven months. There are some individual variations mentioned before. The dental formula for permanent teeth in dogs is:  $2x (I3/3; C1/1; PM 4/4; M2/3) = 42$ .

Cats' deciduous dentition eruption starts around 11-15 days, and it is complete by one-two months of age. The dental formula for deciduous dentition in cats is:  $2x (I3/3; C1/1; PM3/2) = 26$ . Cats' permanent dentition eruption starts around three months of age and it is complete by the age of six-seven months. The dental formula for permanent dentition in cats is:  $2x (I3/3; C1/1; PM3/2; M1/1) = 30$ . By the age of seven months, whether we speak about cats or dogs, if most of the teeth are present on the dental arch, any missing tooth should be radiologically investigated.

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Hypodontia is the absence of a few teeth (usually between 1-6). Oligodontia is the absence of many, but not all teeth. Anodontia is the absence of all teeth (5). An embedded tooth is a tooth that is unerupted usually because of a lack of eruptive force. An impacted tooth is a tooth prevented from erupting by some physical barrier in the eruption path (9). The retained tooth is either an impacted or embedded tooth (2).

Clinically missing teeth from the dental arch should be radiologically investigated in order to establish a differential diagnosis between hypodontia/oligodontia/anodontia or retained tooth/teeth. Hypodontia, oligodontia, and anodontia are pathological states that may appear in a genetic disorder context or may be due to disturbances that occurred during the initial stages of tooth formation. Recognized factors for disturbing teeth formation are environmental factors such as infection, different kinds of trauma in the apical area of the dentoalveolar process, chemical substances or drugs, radiation therapy or disturbances in the jaw innervations, or genetics (4). The patient's history will clarify which of these factors was involved. Whenever possible, examining parents' oral cavity status or maybe the whole litter's mouth will clarify whether we talk about inherited abnormality or not. Additional genetic tests may be performed for a clear diagnosis. Attention should be paid to breeds with hereditary hair loss, like Mexican Hairless, Chinese Crested, American Hairless Terriers in dogs. Hereditary alopecia is associated with dental abnormalities, like hypodontia.

The explanation resides in the fact that the hair and the teeth derive both from the ectoderm. When a retained tooth lacks the force of the eruption, the specific term is an embedded tooth. An embedded tooth remains completed or partially covered by bone or soft tissue or both. Those obstructed by contact against another erupted or non-erupted tooth on its way to the dental arch is referred to as impacted teeth (9). The teeth develop inside the jaws in a sack of epithelium surrounding the crown. While erupting, and getting out of the gingiva, the epithelium over the crown is lost. If the tooth is retained, the surrounding epithelium remains around the unerupted crown, producing in time various amounts of fluids, causing a dentigerous cyst. Dentigerous cysts develop around the crown of an unerupted tooth, anchored at the cemento-enamel junction. So that, the crown is localized inside the cyst and the root outside. Dentigerous cysts expand in time, causing complications in adjacent bone and teeth. Neoplastic transformation into ameloblastoma and epidermoid carcinoma is cited in the literature. Histopathological evaluation is mandatory in dentigerous cysts (2). According to Bellei et al., 2019, 44.4% of the impacted teeth may develop dentigerous cysts, being the main reason for identifying impacted teeth as earlier as possible (1).

## MATERIALS AND METHODS

Seven cases with at least one missing tooth on the dental arch, aged under two years of age, were selected. Six dogs and one cat were involved in our approach to this theme. There is no dentistry without general anaesthesia and dental X-Rays. Biochemical blood tests and haematology panels, all together with a thorough clinical exam were performed as preanaesthetic investigations. Dental X-Rays may be taken only under general anaesthesia. Anaesthesia was medically induced with propofol and after intubation, was maintained with isoflurane. One case of a dog was selected for not taking action, as a tooth was not present inside the bone and the lack of the tooth did not require an action. Three cases of retained teeth were selected with different therapeutical approaches. Operculectomy was performed on one dog, a cyst enucleation and bone reconstruction in a cat, and a surgical extraction for another dog. Three cases of a call to action were selected by correlating the local factors, the missing teeth, the financial possibilities, and the cooperation with the patient. So that, one had a removable denture, one dental bridge, and one dental crown inserted on a dental implant.

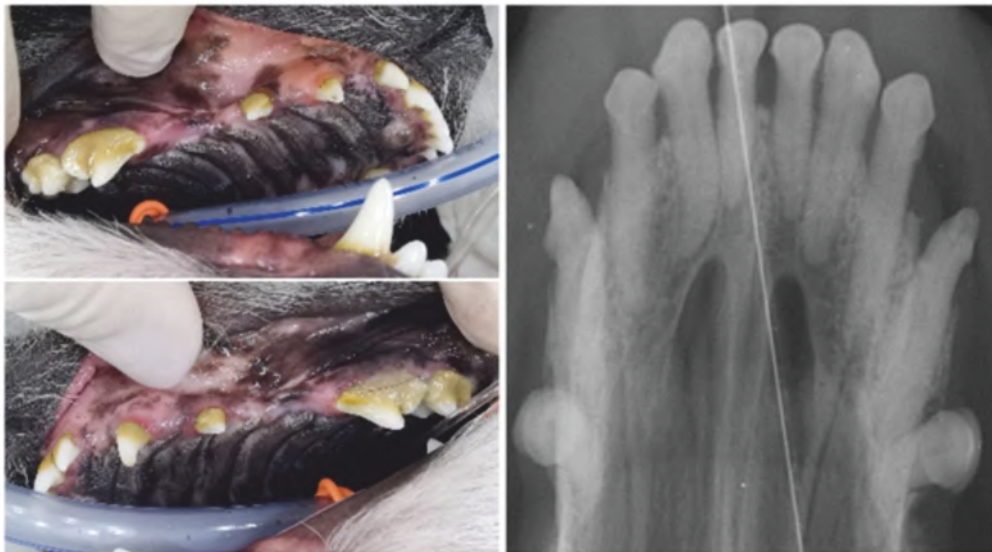
## RESULTS AND DISCUSSIONS

### ***Case number one – not taking action***

A year and a half old, male, Chinese Crested dog was presented for dental cleaning. Clinical examination revealed the persistence of 504, 604, and extended lateral edentulous spaces on the maxillae. Increased deposits of dental plaque were noticed on the teeth limiting the edentulous area. Dental X-Rays confirmed the agenesis of 104, 204, 106, 107, 206, and 207. After establishing that there are no retained teeth, together with the owner a no-taking action decision was made, regarding the missing teeth. Professional cleaning was performed and oral hygiene instructions were delivered (Fig. 1).

### ***Case number two – removable prosthetics***

A Giant Schnauzer female, at the age of one year, was presented with a 308 missing from the dental arch. A dental X-Ray established the absence of the 308. Together with the owner, we made a removable prosthesis to participate in at the dog shows. The dog was cooperative and tolerated well the removable prosthesis during the shows. Some exercises at home were done before exposing the dog in public. She was calm, and nothing in her behaviour changed when wearing the prosthesis. She gave birth to two litters with complete dentures. None of the descendants had a 308 or any other tooth missing (Fig. 2).



**Fig. 1.** Intraoral aspect of persistent deciduous canines, 504, 604, and the radiologic aspect confirming the absence of 104, 204. Note the increased dental plaque deposits on the adjacent teeth

**Case number three – dental bridge**

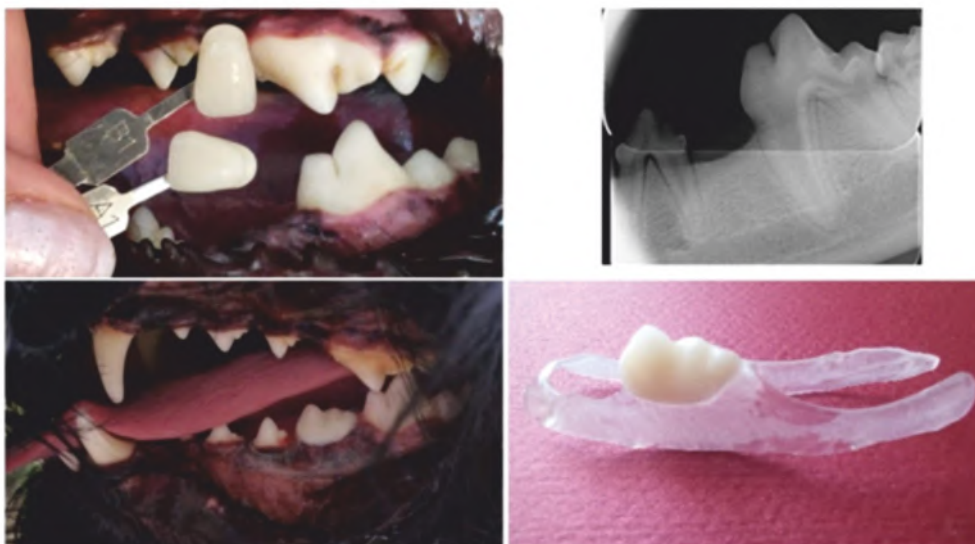
Is the case of a one-year-old Caniche Miniature, male dog. The patient presented only four upper incisors (103, 102, 202, 203), instead of six. The missing teeth, confirmed radiologically, were 101, and 201. The space was completely closed and no edentulous space was present on the maxillae. The medical team decided to ensure the correct number of teeth by manufacturing a zirconia dental bridge. A three-year check-up for the dental bridge shows no alterations in the area, the bridge is present, no fractures of the crown, correct oral hygiene, no periodontal disease, and no loosening. He was taken out of reproduction, so we do not know whether the defect is genetically transmitted or not (Fig. 3).

**Case number four – dental implant**

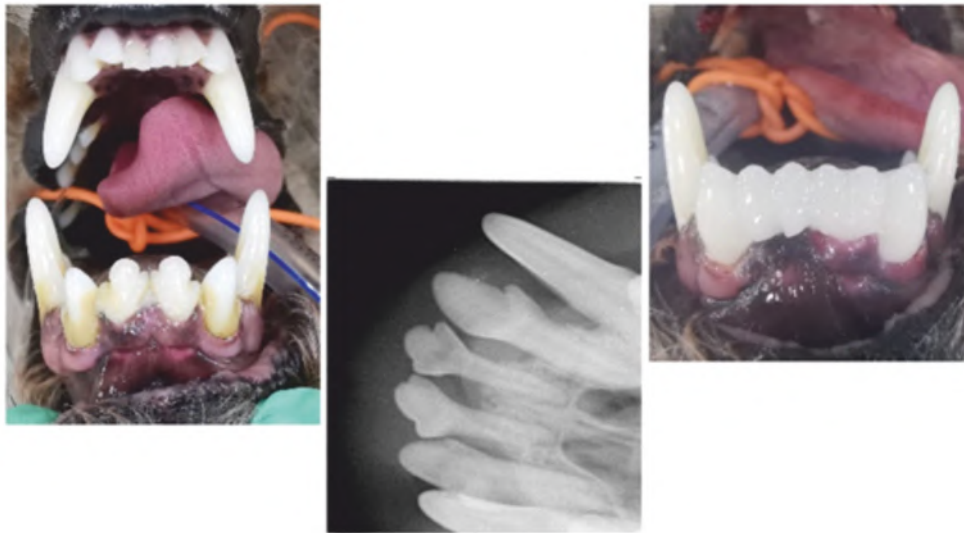
Case number four is the case of an eleven-month-old male, Rottweiler dog with an agenesis of 206. The agenesis was treated with a dental implant. A zirconia crown was inserted into the dental implant. One-year follow-up for the dental implant revealed high stability, with no signs of peri-implantitis. In addition, no loosening, fractures, or other accidents were registered. He was taken out of reproduction (Fig. 4).

**Case number five – operculectomy**

A Shi-Tzu dog, aged seven months, was presented for the lack of 401. Preoperative radiographic imaging revealed a shallow impaction of the tooth. 401 was lo-



**Fig. 2.** Clinical situation with and without the removable denture. Note the radiologic aspect of the missing 308



**Fig. 3.** Initial situation with the absence of 101 and 201, confirmed by dental X-Ray and the final restoration placed in the oral cavity

calized mesial and rostral to 402. The tooth was resting with the distoincisor angle underneath the crown of 402. Operculectomy was decided based on the radiographic findings. Exploring the gingiva with the dental probe permitted accurate localization, since tooth enamel has a different consistency than the bone. Exposure to more than half of the crown was performed with surgical diode lasers, wavelength 940 nm. After laser-assisted exposure, an eruption impulse was given to the impacted tooth. Operculectomy was healed entirely in one month, and the tooth was completely erupted by that time (Fig. 5).

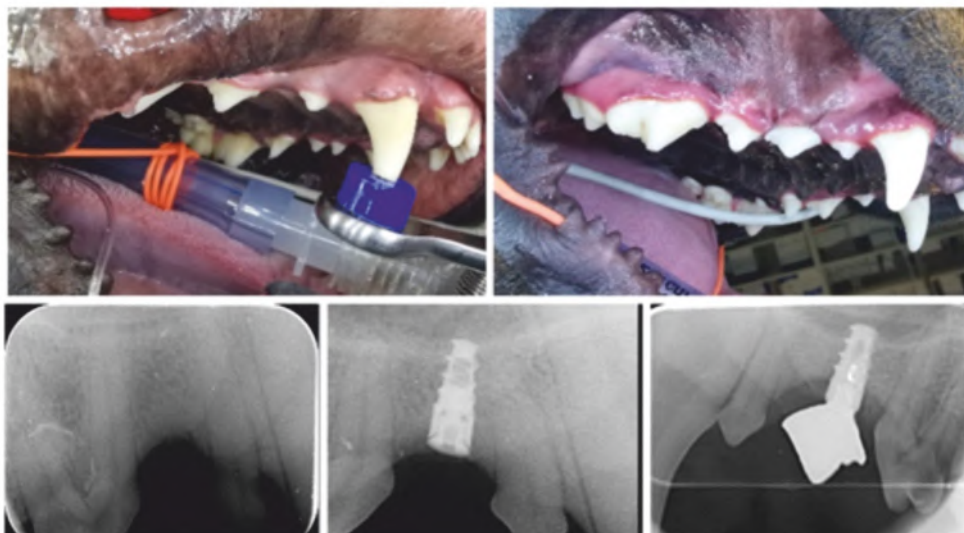
#### **Case number six – surgical extraction**

A case of a mixed-breed dog was presented for the absence of 108. The dog was two-years-old. The tooth

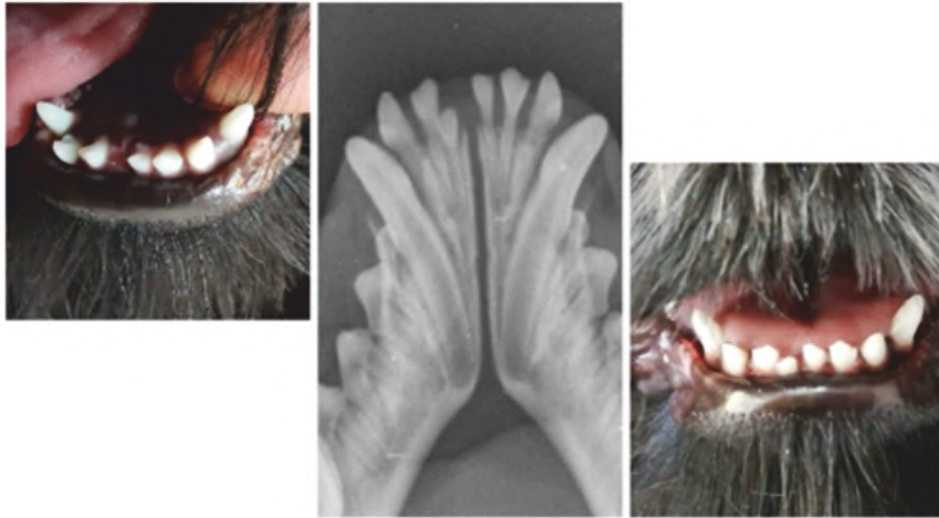
had a morphological malformation, with a 208 looking like a premolar and it was retained inside the bone. The team decided to extract the tooth surgically. Gingival healing was obtained in 14 days (Fig. 6).

#### **Case number seven – enucleation of a dentigerous cyst**

However, due to a deeply impacted 103, a sizeable dentigerous cyst was found in a seven-month-old British Shorthair cat. A British Shorthair cat was presented for facial asymmetry and the presence of an oral mass in the right frontal region of the maxilla. The swelling could easily be seen by lifting the upper right lip, and it left the place only for the lower canine to occlude. The mass was hard on palpation, and the mucosa overlying the swelling had a normal appearance.



**Fig. 4.** Clinical and radiological situation before and after inserting the dental implant in the place of a missing 206



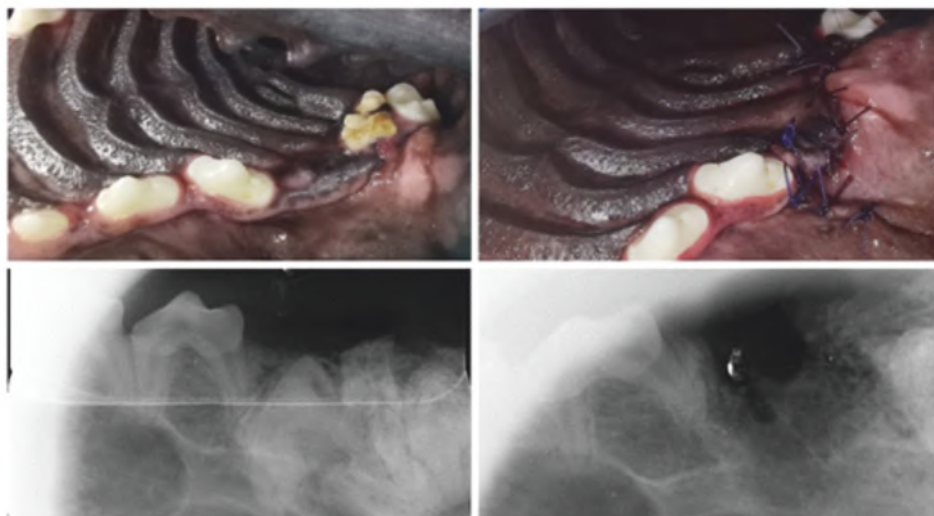
**Fig.5.** Intraoral situation before and after operculectomy and the radiological situation confirming the presence of 401

However, 103 was missing from the dental arch, and 102 and 101 were displaced to the left. Dental X-Rays revealed a circular, unilocular, radiolucent lesion with a well-defined cortex enclosing the crown of the upper right maxillary incisor, 103. In addition, the adjacent teeth in contact with the cyst, 102 and 101, had their roots displaced. The dentigerous cyst was managed by extracting the unerupted tooth and the ones displaced, altogether with the enucleation of the entire cyst. A synthetic bone substitute was placed. The excised tissue was sent to the pathologist, confirming the diagnosis of a dentigerous cyst. Complete enucleation of the dentigerous cyst and bone augmentation permitted the adjacent canine to continue developing. One year follow-up showed that the pulp chamber of the 104 had similar dimensions to the one

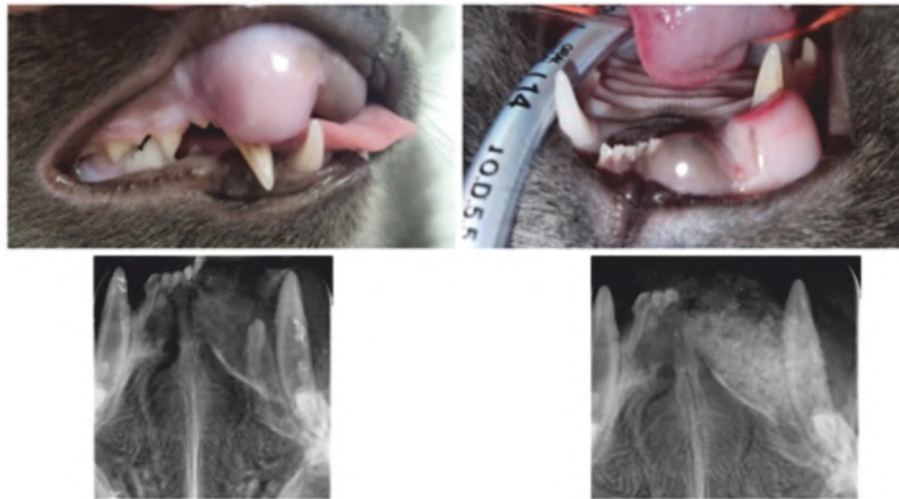
of 204. No recurrence of the cyst was noticed and complete healing was achieved (Fig. 7).

Dental radiography will clear up whether the tooth is or is not present inside the maxilla or mandibula when diagnosing a clinically missing tooth. If the tooth is absent, there are several treatment options from taking no action, to complex, innovative solutions, like dental implants. If the tooth is present, it is important to establish its position and the causes that interfered with the dental eruption. If possible, the tooth may be straightened and brought onto the dental arch. If the tooth is deeply impacted, after the normal time of the eruption, lacking the force for eruption, or in a malposition, authors' opinions converge, stating that it is imperative to extract the involved tooth.

Local complications that may appear in time, do not



**Fig.6.** Clinical and radiological situation of a 108 in a malposition and with abnormal morphology, before and after surgical extraction



**Fig. 7.** Clinical and radiological situation of the dentigerous cyst of 103

justify a no-taking action decision.

Dealing with a missing tooth, confirmed by dental X-Rays, that it is not present inside the bone, one may take no action. Attention should be paid to dental plaque and oral hygiene in the area. The dental deposits increase on the teeth limiting the edentulous area as the automatic cleaning made during mastication will be reduced by avoiding food impact on the gingiva. When speaking about permanent teeth eruption, it is known that the root of the corresponding deciduous tooth is gradually resorbed by osteoclasts (odontoclasts). Consequently, when a deciduous tooth is shed, it consists only of the crown and the uppermost part of the root (10). In these cases of lacking the permanent tooth, it is encountered the persistence of the temporary teeth on the dental arch over the normal period, as osteoclasts are missing the impulse to activate themselves to resorb the deciduous tooth's root. Unfortunately, there are no studies to clarify the direct relationship between tooth agenesis and its genetic transmission. Therefore, it needs to be established if it is necessary to take out of breeding the patients with missing teeth. When the tooth is present and retained, a therapeutical decision has to be made, as possible complex complications in time are predictable. If the tooth is embedded in a favourable position for eruption, one may try an operculectomy. Operculectomy is the excision of the soft tissue overlying an unerupted tooth (11). Excision may be performed classically, with cold steel, or by surgical laser. Operculectomy, performed with the aid of diode surgical lasers, for impacted teeth, ensures a clean surgical field and decreases the risk of intraoperative and postoperative complications (7).

Dentigerous cysts in cats are rarely reported as they are less found in everyday practice. One of the most straightforward therapeutic solutions for a missing tooth is a removable prosthesis applied only for a

certain time. Removable prosthetics involve a locally non-invasive procedure. It is a dental device designed to replace one or more missing teeth. Removable dentures may be placed or taken out at one's willingness. But, more importantly, they may be cleaned perfectly. They may not be used for chewing. They are designed only for aesthetics. The dog needs to be used with the removable device, so some training is required. When the missing teeth are absent and the space is closed, a classical dental bridge may be performed. A dental bridge is a permanent prosthetic device designed to replace one or two missing teeth by anchoring on the adjacent teeth. It is a locally invasive procedure, but it has many more advantages than removable dentures. The dental bridge is fixed so that it may be used for chewing. The resistance may be high depending on the material that prosthetics are made of. Zirconia is the newest dental material, highly biocompatible, and has a more heightened mechanical resistance than metal (according to producers,) cleaning of the dental bridge is assured during home-care toothbrushing, like any other natural teeth. A dental implant is a structure of titanium inserted into the oral tissues beneath the mucosa and periosteum and within the bone, to provide retention and support for a fixed dental prosthesis. Well-known in human dentistry, dental implants prove their efficacy even in veterinary dentistry. Dental implants require unique technology, a skilful surgeon who knows well the anatomy of the region and enough bone to ensure stability and long-term results. Costs are also higher than the previously presented prosthetic solutions. Nevertheless, they have more advantages than any other prosthetic solution for a missing tooth. They are locally minimally invasive and do not require preparing the adjacent teeth, with fewer endodontic complications. A surgical extraction remains the golden standard if the tooth is present but in a malposition that emerges with the eruption corridor.

## CONCLUSIONS

The oral cavity should be examined from the veterinary doctor's first visit. By six months, dogs and cats should have the dental eruption process finished. Counting their teeth will lead to an early diagnosis of missing teeth in permanent dentition. Further studies for clarifying whether one missing tooth is genetically inherited need to be performed. Every therapeutical solution has proved its efficacy in time. This was achieved by carefully selecting the most suited therapeutical solution, adapted to the local conditions. Furthermore, a concise diagnosis, good communication with the owners, ensures long-term success. If the tooth is present, inside the bone, there is no possibility of not taking action. The local complications that may develop in time do not justify the no-taking action.

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### **Conflicts of Interest:**

The authors declare that they do not have any conflict of interest.

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