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Cutaneous sinus tract of endodontic origin: a case report

Key words  apical periodontitis, cutaneous sinus tract, root canal treatment

Aim: To report an uncommon case of an extraoral sinus tract of the submandibular region caused by a molar in the mandible (tooth 47).

Case report: Tooth 47 presented with an insufficient coronal restoration and an absence of pain and discomfort to pressure and palpation in the periapical region. Based on oral inspection and radiographic examination, a pulp necrosis of tooth 47 was diagnosed, which had resulted in a cutaneous sinus tract. The persistent purulent drainage of the sinus tract in the submandibular region ceased during the successful root canal treatment of tooth 47. The root canal was irrigated with copious irrigant (3% sodium hypochlorite, 0.9% sodium chloride, 2% chlorhexidine) and several intracanal calcium hydroxide dressings.

Conclusion: In the presented case it was observed that it is challenging to diagnose a cutaneous draining sinus tract of endodontic origin. Thus, treatment of skin lesions of the face, and neck odontogenic infections should always be considered. Clinical and radiographic dental examinations can identify the tooth involved and may avoid unnecessary antibiotic or surgical therapies. Proper disinfection of the root canal system by chemo-mechanical instrumentation resulted in resolution of the sinus tract and promoted periapical healing of the tooth involved. This should therefore be considered as the treatment of choice when dealing with an odontogenic extraoral sinus tract.

Introduction

Chronic periapical inflammation drains along the path of least resistance, which commonly terminates in the form of a sinus tract, intraorally vestibular to the affected teeth\(^1\). However, in some cases, depending on the relation between the localisation of the periapical lesion and the facial muscles and fasciae, sinus tracts may drain extraorally. Maxillary teeth drain extraorally when the infection is localised above, and in the mandible when the infection is localised below the muscle and fascia attachments. The tracts occur more frequently from periapical lesions caused by mandibular teeth (80%) than from those caused by maxillary teeth (20%)\(^2\) and this results predominantly in the appearance of cutaneous sinus tracts of dental origin in the submental and submandibular regions\(^3\)-\(^5\). The tracts rarely appear in the nasal region\(^6\)-\(^8\).
Sinus tracts of dental origin are a diagnostic problem due to the opening on the skin and the absence of oral symptoms. Possible differential diagnosis of a cutaneous draining sinus tract include congenital fistula, salivary gland fistula, infected cyst, deep mycotic infection, skin lesions such as furuncles, traumatic and iatrogenic lesions, osteomyelitis, neoplasm, tuberculosis and actinomycosis.

The presented case shows that the diagnosis of cutaneous sinus tracts of dental origin is challenging, yet the treatment may be carried out easily.

Case report

Anamnesis and medical history

A 46-year-old woman suffering from paranoid psychosis consulted the Clinic of Dermatology in Marburg (Germany) due to a persistent skin lesion located in the submandibular right side of her neck. The patient stated that the lesion had been present for at least 1.5 years.

Skin biopsies and histopathological examinations were performed twice. The tentative diagnosis of lymphadenoma was disproved and no signs of malignancy were detected. A new suspected diagnosis of 'mechanical manipulation', was proposed. The patient was referred to the Department of Surgery of the Dental School in Marburg (Germany) to examine for a possible dental infection.

A panoramic radiograph revealed a radiolucent area periapical to tooth 47. After inserting a gutta-percha cone into the sinus tract, a radiograph of tooth 47 and a panoramic radiograph of the right side displayed the course of the sinus tract by means of a gutta-percha cone.

The radiograph of tooth 47 showed interproximal caries below the distal part of the restoration (Fig 1). Furthermore, a self-threading pin close to the distal pulp horn was visible. The location of the restoration close to the pulp chamber and the insufficient margin of the coronal restoration at the mesial aspect of the tooth were noted.

Diagnosis

The patient was suffering from an asymptomatic pulpal necrosis with a suppurative apical periodontitis and a cutaneous sinus tract emanating from tooth 47.

Treatment protocol

Root canal treatment of tooth 47 was initiated by an undergraduate dental student. Tooth 47 was isolated with rubber dam and a standard access cavity was prepared. Three root canal orifices were detected and all root canals were irrigated with copious amounts of 3% sodium hypochlorite (NaOCl).

Electric measurements of all root canal lengths were performed with an apex locator (Raypex 5®, VDW, Munich, Germany) and established working lengths were controlled radiographically with inserted silver points in each root canal after sealing of the cavity with a silicone impression material (Silasoft®, Detax, Ettingen, Germany). The use of silver points adjusted to the length of the root canal as well as the temporary closure of the cavity with silicone material allow the use of a long cone parallel technique with film holder for the digital imaging plate (Digora Optime®, Soredex, Tuusula, Finland).
In addition, sealing of the cavity with a silicone impression material prior to the removal of the rubber dam avoids saliva contamination of the root canal system, and silver points provide higher radiopacity (compared with root canal instruments) and this simplifies the determination of the working length. Additionally, no metal rubber dam clamp is projected on the root canal system, which may cover information regarding the length of the silver points and the anatomy of the root canal system. Immediately after the radiograph was taken, the rubber dam was placed and the temporary silicone sealing and the silver points were removed.

Subsequently, the root canals were filled with medical dressing and the cavity was sealed with a temporary filling (Ketac™ Fil Plus Aplicap, 3M ESPE, Seefeld, Germany). This was because the treatment session in the student’s course was limited. The sinus tract was still active and draining pus (Figs 2 and 3). Further treatment was carried out by an endodontist (SY) and 17 days later working lengths were re-established radiographically (Fig 4). All root canals were then shaped using rotary nickel-titanium instruments in a crown-down approach (FlexMaster®, VDW, Munich, Germany). The master apical file (MAF) was a size 35 for the mesio-lingual and mesio-buccal and a size 45 for the distal root canal. Glyde™ (Dentsply Maillefer, Ballaigues, Switzerland) was used as a lubricant. Disinfection was achieved by the use of 3% NaOCl, 0.9% sodium chloride (NaCl) and 2% chlorhexidine.
Tooth 47 was asymptomatic and the sinus tract orifice healed. The insufficient coronal restoration was replaced prior to local gingival anaesthesia and mesial and lingual gingivectomy. The root canals were dressed with an aqueous Ca(OH)$_2$ (calcium hydroxide) suspension (Calxyl®, Oco, Dirmstein, Germany) and the tooth was restored with a temporary adhesive restoration (PhotacTM, 3M ESPE, Seefeld, Germany). Approximately 1 month later the sinus tract was still inactive. The patient confirmed healing tendency by her statement that it had not drained for the last month. After applying a rubber dam and removal of the intracanal dressings, gutta-percha master cones were fitted. The fit of the master cones was checked by looking at the radiograph (Fig 5) and this confirmed the electronically established working lengths. Copious irrigation of the root canals was performed with different irrigants. The root canals were obturated with laterally compacted gutta-percha and sealer (AH Plus®; Dentsply, Konstanz, Germany). Root canal fillings were coronally sealed by a thin layer of a flowable composite (Tetric® Flow, Ivoclar Vivadent) followed by several increments of a packable composite (Venus®, Heraeus Kulzer, Hanau/Germany). A control radiograph was taken to assess the obturations (Fig 6).

Approximately 3.5 months after completion of the root canal treatment a follow-up radiograph was taken (Fig 7). This showed diminishment of the periapical lesion and thereby revealed some healing was occurring.

Nine months after the conclusion of the root canal treatment, the final restoration of the tooth was carried out. A fibre post was inserted in the distal root canal and was luted with a dual curing resin (Bifix SE, VOCO, Cuxhaven, Germany). Then the tooth was prepared for a zirconium dioxide ceramic crown. Additional radiographs, as well as previous photographs, documented further healing of the periapical periodontitis (Figs 8 to 12).

### Discussion

In the present case the likely reason for the cutaneous sinus tract was infected pulp necrosis, probably caused by an insufficient coronal restoration. The persistent apical periodontitis led to a formation of a sinus tract.

In cases of an odontogenic cutaneous sinus tract, patients usually initially consult a general practitioner or a dermatologist due to the lack of dental symptoms and the unknown possible correlation. It is very important to consider dental reasons for inflammatory and persistent processes in the skin area of the face and neck. The unnecessary biopsies in the present case were carried out twice and caused a delay in therapy as well as scarring. Unfortunately, mistreatments in such cases are common. One case describes the total removal of the glandula submandibularis because it was considered responsible for inflammation. Roughly 50% of the patients affected have to deal with unnecessary surgical excisions, radiotherapy, antibiotic therapy and multiple biopsies before the correct diagnosis is established.
Fig 7  Follow-up radiograph approximately 3.5 months after root canal filling (09.05.2008).

Fig 8  Periapical status 9 months after root canal filling (31.10.2008).

Fig 9  Endodontic recall: sinus tract shows healing (scar) (31.10.2008).

Fig 10  Extraoral view of the former sinus tract opening approximately 1 year after root canal filling (09.02.2009).

Fig 11  Scarring of the former sinus tract opening 16 months after root canal filling (28.05.2009).

Fig 12  Radiograph of tooth 47, 17 months after root canal filling (04.06.2009). Fibre post placed in distal root canal and almost complete restitution of the periodontal tissue.
Correct diagnosis of a cutaneous sinus tract of dental origin can be detected by correct oral investigation, visual inspection, tapping, pulp sensibility tests and a radiographic delineation of the sinus tract with a gutta-percha cone placed in it. An additional computed tomography scan can provide further information on the location of the jaw perforation (vestibular or oral) and, for example, check the distance from the mandibular canal. The histological examination results of odontogenic cutaneous sinus tracts were unequal. An epithelial lining of the whole sinus tract seldom occurs but it is often present in the cutaneous openings. Most of the sinus tracts were not epithelialised and only bordered by granulation tissue. It is commonly assumed that an epithelial lining may cause complications in healing. The longer the sinus tract exists the more likely it is to have an epithelial lining.

The therapy of cutaneous sinus tracts of dental origin consists of the removal of the infection source. After elimination of the reason for the infection by root canal therapy, the sinus tract regularly disappears within 2 weeks. Formerly, additional surgical treatment such as root end surgery or/and removal of the sinus tract was common. Nowadays, orthograde root canal treatment is favoured, and surgical revision is only applied in non-healing cases.

Root canal irrigation is one of the most critical procedures and a very important factor adjudicating on the success of root canal treatment. It is impossible to achieve all desired aims through the use of just one irrigant. Thus, several irrigants were used. NaOCl was used most of the time to irrigate the root canals because of its bactericidal effects and for dissolving residual necrotic tissue. To avoid apical extrusion of NaOCl, thin endodontic needles (NaviTips®, Ultradent, Cologne, Germany) marked with silicone stoppers at 2 mm short of working length were used for irrigation. In several in vitro studies, chlorhexidine digluconate (CHX) was found to be superior to NaOCl in killing Enterococcus faecalis and Staphylococcus aureus. Furthermore, CHX is also effective against Candida albicans. Some authors reported that the alternating use of NaOCl and CHX irrigants resulted in a greater reduction of microbial flora when compared with the individual use of NaOCl or CHX alone. Therefore, in the present case the root canals were also irrigated with CHX. It was observed that the alternating root canal irrigation with NaOCl and CHX caused precipitation of a carcinogenic compound para-chloraniline. To avoid this, NaCl was used to the flush the canals between the use of NaOCl and CHX. The combination of chemo-mechanical root canal preparation and intracanal dressings using an aqueous Ca(OH)2 paste appeared to promote a favourable environment for osseous repair and the resolution of the sinus tract.

Conclusions

Persistent skin lesions located in the face and neck area may be an indicator of chronic odontogenic infections. In these cases a dental source of infection should always be excluded prior to invasive diagnostic and treatment methods. Root canal treatment of the affected tooth is the treatment of choice when dealing with a sinus tract that is of endodontic origin. The histological border of the sinus tract is of no relevance. Surgical treatment such as root end surgery should only be considered in cases resisting conservative therapy.

References