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Letter to the editor

Squamous cell carcinoma around a dental implant: A case report and literature review

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Dear Editor,

Dental implants are commonly used today for implant-borne prosthetic rehabilitation in edentulous patients. Most dental implants are made from titanium, but other materials such as zirconia and PEEK (polyetheretherketone) may be used [1]. The biocompatibility of titanium-based implantable materials and the associated tissue response have been widely documented [2]. The most common benign peri-implant lesions are peri-implantitis of bacterial origin. Malignant lesions have been described, which not only affect the prognosis for implant-prosthetic rehabilitation but can also be life-threatening due to adjuvant radiation/chemo radiation [3]. Although rare cases of breast and lung cancer metastases have been described, as well as sarcoma and even plasmacytoma, most malignant lesions in the vicinity of dental implants are squamous cell carcinomas [4,5].

A 73-year-old non-smoker in good general health consulted his dentist for a gingival lesion surrounding an implant. The patient, who was completely edentulous, had been fitted with a full mandibular prosthesis, stabilised by a bar on three symphyseal implants. On clinical examination, the practitioner observed a painless exophytic gingival lesion measuring 2 cm in diameter surrounding the most distal implant on the right-hand side (Fig. 1A). A retroalveolar X-ray revealed bone cratering around the implant in question (Fig. 1B). The practitioner treated the lesion as peri-implantitis by removing the implant and excising the lesion. No histological analysis was performed to confirm this diagnosis. Six weeks later, the lesion recurred and the practitioner referred the patient to the dental hospital. An exophytic, keratotic, inhomogeneous, sessile gingival swelling measuring over 2 cm was observed (Fig. 1C). The clinical picture and the fact that this was a recurring lesion suggested a diagnosis of squamous cell carcinoma; a biopsy was therefore performed on the lesion. The biopsy sample was a fragment including both part of the lesion and an apparently healthy area. The conclusion from the histological analysis was that the lesion was a wart-like epithelial hyperplasia showing no signs of dysplasia. Based on this diagnosis, the entire lesion was resected, with a safety margin. The surgical wound was closed by mucosoplasty. Subsequent analysis of the surgical specimen identified a keratinizing differentiated squamous cell carcinoma (Fig. 1D).

The patient was therefore sent to the ENT department for staging. The therapeutic choice consisted of right anterolateral partial glossectomy combined with ipsilateral lymphadenectomy without radiotherapy. Histological analysis of the surgical specimens showed full inclusion of the lesion and the absence of any tumour residue. Four years have passed without recurrence, and the patient is still being monitored.

A separate case of initial misdiagnosis of peri-implantitis in a context of buccal carcinoma has previously been reported in the literature [6,7]. In the case presented here, the contradictory data obtained from the physical examination (keratotic inhomogeneous appearance) and from the pathological examination (hyperplasia showing no signs of malignancy) should have prompted further investigation (if multiple biopsies had been performed, they would have obtained a diagnosis of malignancy). No link could be found between the onset of this lesion and any of the known contributing factors (e.g. tobacco, alcohol, an irritant prosthesis or a history of squamous cell carcinoma [8]).

A systematic PubMed search of all English-language articles published between 1980 and 2017 was conducted with “squamous cell carcinoma” and “dental implant” MeSh terms. The search was conducted between July 2016 and July 2017. Only articles reporting squamous cell carcinoma around a dental implant were selected. This literature review identified 20 articles reporting on a total of 43 patients who had developed a squamous cell carcinoma (Table 1) in the vicinity of a dental implant and revealed only four cases similar to the case presented in this article, where the patient had no history of cancer and no risk factor was identified [7,9–11]. Although we cannot exclude a simple topographic coincidence, we must also consider the possibility that the implant played a role in the cancer’s development or in its spread to the jaw bone. A number of carcinogenic mechanisms likely to involve dental implants have been suggested, including a corrosion-product effect, release of metal ions and migration of malignant cells in contact with the gum-bone-implant surface [6,11]. Nonetheless, Bhola *et al.* [12] demonstrated variable corrosion rates depending on the type of titanium alloy used. Indeed, in 2006 the International Agency for Research on Cancer (IARC) classified titanium dioxide (TiO_2) as a possible carcinogen for human beings. However, no causal relationship has been demonstrated between tumour development and titanium in the few reported cases of squamous cell carcinoma associated with dental implants, since studies were unable to exclude the existence of statistical confounding factors. Schache *et al.* [11] demonstrated that the presence of an implant can be a gateway for malignant cells, allowing them to reach the bone through the gingival sulcus; squamous cell carcinoma could then proliferate from the epithelium to the bone as

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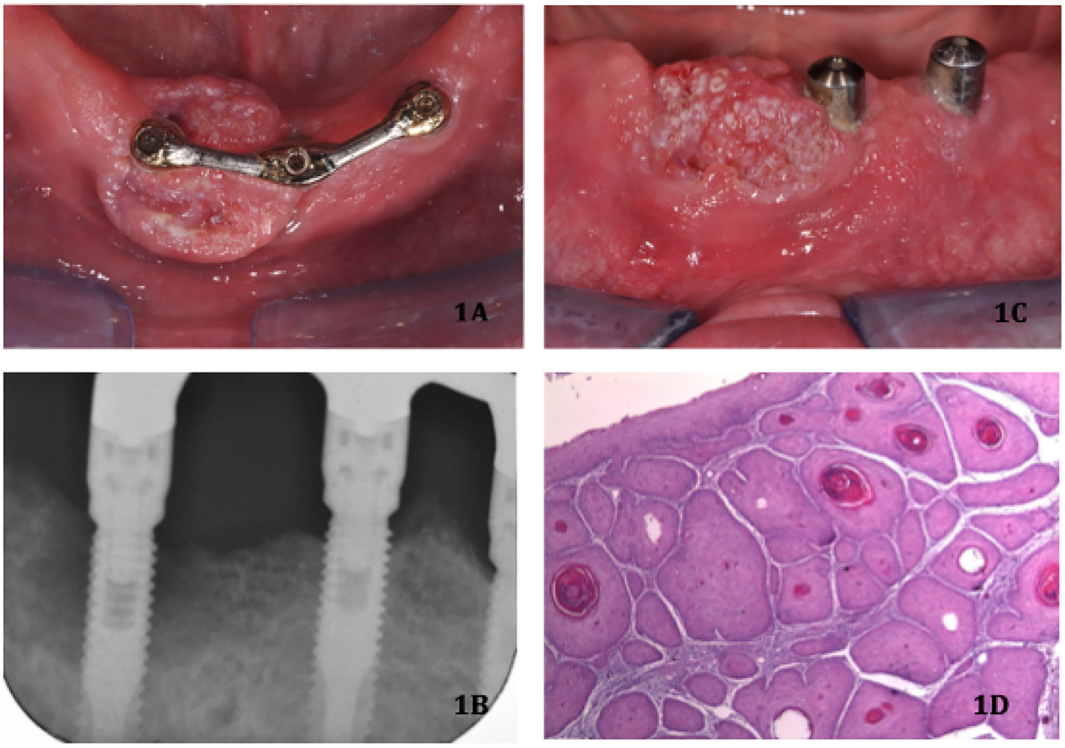

Fig. 1. Exophytic gingival lesion measuring 2 cm in diameter surrounding the most distal implant on the right-hand side (A) and recurrence of the lesion 6 weeks after the first excision (B). A retroalveolar X-ray showing bone cratering around the implant (C) and the histologic analysis of the surgical specimen identified a keratinizing differentiated squamous cell carcinoma (HE staining, x10) (D).

Table 1
20 articles reporting on a total of 43 patients who developed a squamous cell carcinoma in the vicinity of a dental implant.

Publication	Genre	Age	Tumour location	Risk factor	Tumour history
Friedman, 1983	Man	65	Lower jaw	Tabacco	None
Clapp, 1996[7]	Woman	65	Lower jaw	None	None
	Man	79	Lower jaw	Alcohol	None
	Woman	90	Lower jaw	Tabacco withdrawal Alcohol	Squamous cell carcinoma
Moxley, 1997	Woman	74	Lower jaw	None	Buccal verrucous carcinoma
Block, 2001	Man	72	Lower jaw	Tabacco withdrawal Oral lichen planus	Buccal verrucous carcinoma
Shaw, 2004	Man	67	Lower jaw	Not documented	Squamous cell carcinoma
	Woman	69	Lower jaw	Verrucous lichen	Squamous cell carcinoma
Czerninski, 2006	Woman	52	Lower jaw	Tabacco withdrawal Oral lichen planus	None
	Man	80	Lower jaw	None	Squamous cell carcinoma Colon cancer Hepatic metastasis
Abu El-Naaj, 2007[5]	Woman	70	Lower jaw	None	Thyroid cancer Breast cancer
	Man	72	Lower jaw	Tabacco Oral lichen planus	None
Eguia del Valle, 2008[6]	Man	76	Lower jaw	None	None
Gallego, 2008[3]	Woman	81	Lower jaw	None	Squamous cell carcinoma
Kwok, 2008	Man	62	Lower jaw	Tabacco withdrawal Alcohol	None
	Man	71	Lower jaw	Tabacco withdrawal Alcohol	None
	Woman	67	Lower jaw	Tabacco withdrawal Alcohol	2 Tongue squamous cell carcinoma Breast cancer
Schache, 2008[9]	Man	77	Lower jaw	Not documented	None
Gallego, 2009	Woman	70	C Lower jaw	Prosthetic injury	None
Gulati, 2009[4]	Woman	62	Lower jaw	Tabacco withdrawal	Squamous cell carcinoma
De Ceulaer, 2010	Woman	77	Lower jaw	None	Squamous cell carcinoma
	Man	71	Lower jaw	None	Squamous cell carcinoma
	Woman	62	Lower jaw	None	Squamous cell carcinoma
Meijer, 2010	Woman	65	Lower jaw	Not documented	Squamous cell carcinoma
Bhatavadekar, 2012[8]	Man	54	Upper jaw	None	None

(*continued on next page*)

Table 1 (*continued*)

Publication	Genre	Age	Tumour location	Risk factor	Tumour history
Jané-Salas, 2012	Man	42	Tongue near implant	Tabacco withdrawal	None
	Man	79	Tongue near implant	Prosthetic injury	None
Carini, 2012	Man	70	Lower jaw	None	Squamous cell carcinoma
Marini, 2012	Woman	51	Lower jaw	Oral lichen planus	None
Moergel, 2014	Woman	63	Lower jaw	Leucoplasia	Squamous cell carcinoma
	Woman	70	Lower jaw	Tabacco Leucoplasia Erythroplasia	Squamous cell carcinoma
	Man	72	Lower jaw	Leucoplasia	Squamous cell carcinoma
	Man	57	Lower jaw	Leucoplasia Tabacco/Alcohol	Squamous cell carcinoma
	Man	72	Lower jaw	Leucoplasia	None
	Woman	54	Lower jaw	Tabacco withdrawal Oral lichen planus	None
	Man	47	Lower jaw	Tabacco/Alcohol	None
	Man	88	Lower jaw	Leucoplasia	None
	Woman	42	Lower jaw	Leucoplasia	Squamous cell carcinoma
	Woman	59	Lower jaw	Leucoplasia	Squamous cell carcinoma
	Man	73	Upper jaw	Tabacco withdrawal/Alcohol Leucoplasia Erythroplasia	Squamous cell carcinoma
	Man	77	Lower jaw	Leucoplasia Tabac/Alcohol	None
	Woman	68	Lower jaw	Leucoplasia Tabac/Alcohol	Squamous cell carcinoma
	Woman	69	Lower jaw	Oral lichen planus	Squamous cell carcinoma
	Woman	80	Lower jaw	Tabac/Alcohol Leucoplasia Oral lichen planus	None

no periodontal ligament is present along the implant's surface.

This case adds to the number of existing clinical reports on malignant tumours which have developed in contact with a titanium dental implant. In this context, it is important to remain alert when faced with similar clinical cases, and to ensure they are reported. If a lesion is clinically suspected to be malignant and results are negative, additional and/or repeated biopsies should be performed.

Conflict of interest

All the authors declared any conflict of interest.

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