



## Correspondence

## Anal and dental fistulae: Proposal for a novel treatment with ozone nanobubble saline washing

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## Dear Editor,

Despite scientific advances, at present, it is extremely difficult to treat a fistula at any site, and this is especially so for external fistulae, including an anal fistula [1] or a dental fistula [2,3]. These are, thus, important human health concerns. The condition is caused a problematic local bacterial infection, a primitive disease, that human intelligence has not yet overcome. In an anal fistula [1], an abscess near the anus causes a narrow tunnel in the skin. Thus, a mass resection, including of the fistula, is performed [1]. However, the excision wound at the anus is difficult to close after the operation, and this imposes a chronic physical burden on the patient. There is also the possibility of damaging the sphincter, leading to poor functional outcome. The difficulty of stopping defecation until the wound is repaired also cannot be disregarded. In an external dental fistula [2,3], the abscess is most commonly caused by periapical tooth infection. Treatment involves extraction of the problematic tooth. Gingival inflammation, including periodontitis, root abscess and pyorrhoea, due to indigenous bacteria such as *Porphyromonas gingivalis* in the oral cavity [4] is a common problem in adults. It is difficult to eradicate the bacteria responsible for these narrow fistulae. To make matters worse, neither antibiotics nor saline washing is definitively effective.

Both the anus and the oral cavity are home to indigenous bacteria, and these bacteria are extremely difficult to eradicate. In recent years, the bactericidal effect of ozone has been reviewed, and its application in the medical field has been proposed by some authors [5,6]. In Japan, ozone nanobubble (ONB) water [7], in which nano-sized ozone gas bubbles are suspended in water, has been available on the market. Since 2020, it is marketed as ONB saline (Marukyo Ltd, Japan). However, its approval for medical use has not yet been obtained. The bactericidal

effect and safety of ONB water have already been reported by Hayakumo et al. [7], and clinical studies [8] have identified ONB water as an auxiliary bactericidal agent for periodontal disease. Ozone destroys the bacterial membrane structure owing to its strong oxidizing action, thereby exerting a bactericidal effect. ONB saline is able to maintain the state of nano-ozone gas particles for over 1 year. Moreover, it does not lead to development of antibiotic resistance and has been confirmed to be safe, as it does not damage the oral mucosal tissue [7]. ONB saline can soak into any narrow areas, such as fistulae. This is further enhanced when pressure is applied during delivery, such as via a syringe. When the ONB saline comes into contact with the area of concern for at least 30 s, cleaning and sterilising effects can be expected. The shape and location of a fistula may render it difficult to clean; thus, antibiotics cannot exert their effect. In contrast, ozone's ability to clean and sterilise is well known. Ozone requires approximately 30 s of exposure for its bactericidal activity [7]. Thus, the burden on the patient is much less than that of conventional methods. Fistula treatment using ozone gas has already been attempted, but that of fistula closure has not been observed. It has been pointed out that ozone-facilitated fistula closure cannot be expected [9]. However, the bactericidal power of ozone requires only 30 s.

This should, thus, be further examined using ONB saline instead of the gas itself.

We must aim to overcome diseases caused by primitive bacteria that have plagued humankind since ancient times, using ozone, an "old-fashioned" bactericidal agent. We have a powerful weapon in the form of ONB water/saline [7]. Medical treatment using ONB agents should be further studied.

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