Bacteriological examination of stomach mucosa and periodontal pocket in patients with gastric cancer: A study protocol

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Abstract

Purpose: The preventive effect of oral management on postoperative infectious complications (POICs) is still unclear in gastrointestinal surgery. We previously reported in a retrospective study that periodontal disease (PD) is an independent risk factor for POICs. To elucidate the bacterial relationship between the oral cavity and stomach, we evaluated the preoperative oral environment and examined bacterial culture tests in both periodontal pockets and the stomach mucosa in patients undergoing radical resection for gastric cancer.

Methods: This was a single-arm prospective cohort study. Patients scheduled to undergo gastrectomy for gastric adenocarcinoma were enrolled. Before surgery, the dentists assessed the severity of PD by measuring the periodontal pocket probing depth, collected specimens from periodontal pockets, and submitted those specimens for a bacterial culture examination. Surgeons cut out a piece of the stomach mucosa (20 × 20 mm) from the resected stomach immediately after surgery. We then evaluated the kinds of bacterial strain and the association between the severity of PD and the positive rate of stomach bacterial culture. When patients had POICs, we identified the pathogen.

Keywords: Bacterial culture, stomach mucosa, periodontal disease, postoperative infectious complications

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Introduction

In recent studies, the multidisciplinary approach has attracted attention for reducing the rate of postoperative complications after gastrointestinal surgery, including via patient nutrition management, chemical bowel preparation and early-phase rehabilitation¹⁻³. To this end, some studies have shown the effectiveness of managing the oral function in order to prevent aspiration pneumonia⁴⁻⁶, infectious endocarditis⁷⁻⁹ or postoperative complications in head and neck surgery¹⁰ and esophageal surgery¹¹. It is easy to understand how these efforts can help reduce aspiration pneumonia or wound infection in cases of head, neck or esophageal surgery; however, the influence of oral management on postoperative infectious complications (POICs) following surgery of the more distal gastrointestinal tract, such as stomach or colorectal surgery, remains unclear.

We therefore conducted a retrospective cohort study and showed that periodontal disease is an independent risk factor for POICs. In patients with periodontal disease (PD) whose periodontal pocket probing depth (PPD) was less than 4 mm, the incidence of POICs was extremely low, while the presence of hygiene status, dry mouth, fur on tongue and tooth stumps were not significant risk factors for POICs. One reason why PD causes POICs was reported to be “bacteremia” due to chronic inflammation of the oral cavity¹¹⁻¹³. However, a direct pathway may also exist, where bacteria swallowed from the periodontal pocket cause infection in the abdominal cavity after gastric resection.

We evaluated the preoperative oral environment and examined bacterial culture test findings from both periodontal pockets and the gastric mucosa surface in patients undergoing radical resection for gastric cancer.

Patients and Methods

Patients enrollment

This was a single-institute cohort study. The inclusion criteria of patients are as follows: histologically con-
firmed gastric adenocarcinoma and scheduled to undergo radical gastrectomy with lymph-node dissection. Patients with emergency surgery, the use of antibiotics before surgery, pyloric stenosis and edentulous were excluded from this study.

The study was approved by the Institutional Review Board, and all study procedures were conducted in accordance with the ethical standards of the respective committees on human experimentation (institutional and national) and with the 1964 Declaration of Helsinki and later versions.

The evaluation of PD and perioperative management

The degree of PD was divided into 3 categories according to the PPD: mild (PPD < 4 mm), intermediate (4 to < 6 mm), or severe (PPD ≥ 6 mm)

All patients receive gastrectomy under general anesthesia. Before the skin incision, a prophylactic antibiotic (1.0 g of cefazolin sodium dissolved in 20 mL saline) was administered. The surgeon performed radical gastrectomy with lymph node dissection in accordance with the gastric cancer treatment guidelines. In all cases, a 19-Fr break drain was placed at the supra-pancreatic area after resection. Postoperative management was performed according to the clinical path. The postoperative administration of antibiotics was not routinely performed.

Bacterial culture

The gingival exudate and plaque in the periodontal pocket was extracted and rubbed with a seed swab (Eiken, Tokyo Japan). Immediately after gastrectomy, a piece of the mucosa of the gastric corpus was cut out (about 20 × 20 mm) in a clean environment. The specimen was then stored in an anaerobic culture tube (TERUMO Corporation, Tokyo Japan). The smear test, aerobic culture and anaerobic culture were performed using TSA II with 5% sheep’s blood/chocolate II medium (Becton, Dickinson and Co., NJ, USA), Bromothymol Blue Lactose medium (Becton, Dickinson and Co., NJ, USA), Anaero Columbia RS blood medium (Becton, Dickinson and Co., NJ, USA) and CO2 incubation. Pure culture and identification were performed the day after the culture. Aerobic bacteria were identified using the MicroScan WalkAway 96 Plus (Becton, Dickinson and Co., NJ, USA), and anaerobic bacteria were identified using the RapID ANA II (Thermo Fisher Scientific, MA, USA) (Fig. 1).

Fig. 1 Procedure of bacterial culture

The sample is observed macroscopically, then smear test by gram staining, aerobic culture and anaerobic culture are performed. Anaerobic culture is cultured for 48 hours or more and then performed to pure culture and identification.
Outcomes
We determined the bacterial strain in the periodontal pocket and stomach mucosa and evaluated the association between the severity of PD and the positive rate of stomach bacterial culture. When patients had POICs, we determined the pathogen through clinical examinations by physicians.

References