

Examination of Diseases Requiring Oral Surgery Treated via Medical-Dental Cooperation in the Department of Oral and Maxillofacial Surgery (Biopathology), Okayama University Hospital

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Abstract

Objective: In recent years, the need for dental treatment and dental hygiene management within the perioperative period and supportive advanced medical treatment has been increasing. However, perioperative intervention in diseases requiring oral surgical treatment is not well understood at present. Here we report our investigation of diseases requiring oral surgical treatment in which Department of Oral and Maxillofacial Surgery (Biopathology) at Okayama University Hospital conducted medical-dental cooperation via Division of Hospital Dentistry.

Methods: In the five years from April 2011 to March 2016, we have identified 310 cases that reached the Okayama University Hospital Department of Oral and Maxillofacial Surgery (Biopathology) via the Division of Hospital Dentistry.

Results: The patients were treated in 22 clinical departments, the most prevalent treatment was chemotherapy, followed by surgery and then transplantation. The surgical diseases for which our department was consulted were most commonly diseases of the teeth and periodontal disease (269 cases), followed by inflammatory conditions such as implantitis and osteomyelitis, and mucosal diseases such as lichen planus and leukoplakia. The surgical procedure performed was most often tooth extraction (243 cases); there are few cases of cystectomy and sequestrum. In the majority of cases, the surgical treatment was performed on the initial examination day; in about 84% of cases, surgery was performed within 2 weeks.

Conclusion: Further investigation is necessary into the practice of preventing adverse events non-dental medical departments by increasing the frequency of oral surgical intervention in appropriate cases during the perioperative period.

Introduction

In the perioperative period in the treatment of malignant tumors and heart disease and in organ transplantation there are risks of various complications related to the oral cavity. These include pneumonia, wound infection, malnutrition disorder, and tooth dropout during the operation [1,2,3]. In recent years, problems such as a reduction in the treatment completion rate due to various complications related to the oral environment, prolongation of the hospitalization period, the deterioration of QOL, etc., have arisen, and the importance of patients' oral hygiene environment is increasing [4,5]. At our hospital, the Division of Hospital Dentistry serves as a source for medical support in the perioperative period, and currently staff members from each specialized medical department in the dental system are providing such treatment support [6]. For conditions that require oral surgery, we also promote treatment in cooperation through introduction from the Division of Hospital Dentistry; we work directly with the patient's medical doctor and provide appropriate medical treatment accordingly. In this study, we report cases requiring oral surgery from the Okayama University Hospital Department of Oral and Maxillofacial Surgery (Biopathology), which engaged in medical-dental cooperation through the Division of Hospital Dentistry for five years from April 2011 to March 2016.

Patients and Methods

In the five years from April 2011 to March 2016, we have identified

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310 cases that reached the Okayama University Hospital Department of Oral and Maxillofacial Surgery (Biopathology) via the Division of Hospital Dentistry. The 310 patients included 176 males and 134 females with an average age of 57.15 years. Patients from 17 to 90 years old were treated, with the highest concentration being patients in their 60s. The following seven items were examined retrospectively.

- 1) Gender and age of patient.
- 2) Main department and primary disease.
- 3) Date of First dental-related medical examination calculated from the start date of the treatment for the original disease.
- 4) Disease requiring oral surgery and treatment administered.
- 5) Number of days between first dental counseling and oral surgery.

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6) Patient status before or during the administration of bisphosphonate or anti-RANKL monoclonal antibody.

7) Number of patients who developed symptoms of bone-resorption-inhibitor-related osteonecrosis (anti-resorptive-agent-related osteonecrosis of the jaw, ARONJ).

Results

In order to investigate the kind of treatment the subject is undergoing, we recorded the main department and the underlying disease being treated there. The patients were treated in 22 clinical departments.

The main medical departments providing treatment were the Departments of Breast and Endocrine Surgery (39 cases), Thoracic Surgery (37 cases), Allergy and Respiratory Medicine (35 cases), Digestive Tract Surgery (32 cases), Cardiovascular Medicine (31 cases), Hematology and Oncology (27 cases), Urology (24 cases), and Gastroenterology and Hepatology (19 cases) (Figure 1A). When

the original disease was classified using the International Disease Classification 10th Edition, 196 cases (63%) were classified as neoplasms, with 188 of these 196 cases classified as malignant tumors (Figure 1B).

As a result of investigating the kind of treatment the target patient received, it was found that the most prevalent treatment was chemotherapy, followed by surgery and then transplantation. We investigated each treatment and the number of days after the start date that the first dental examination occurred (Figure 2a-Figure 2c). There was a tendency for the patient to be consulted by the main medical departments via the Division of Hospital Dentistry within one month before the operation in the operation group (Figure 2c) and within two weeks after administration in the chemotherapy group (Figure 2A). In the transplant group, many patients have already visited our department at the time of their inpatient examination (Figure 2c). We investigated the conditions requiring oral surgery and the treatments for which the target patients were being examined in our department.

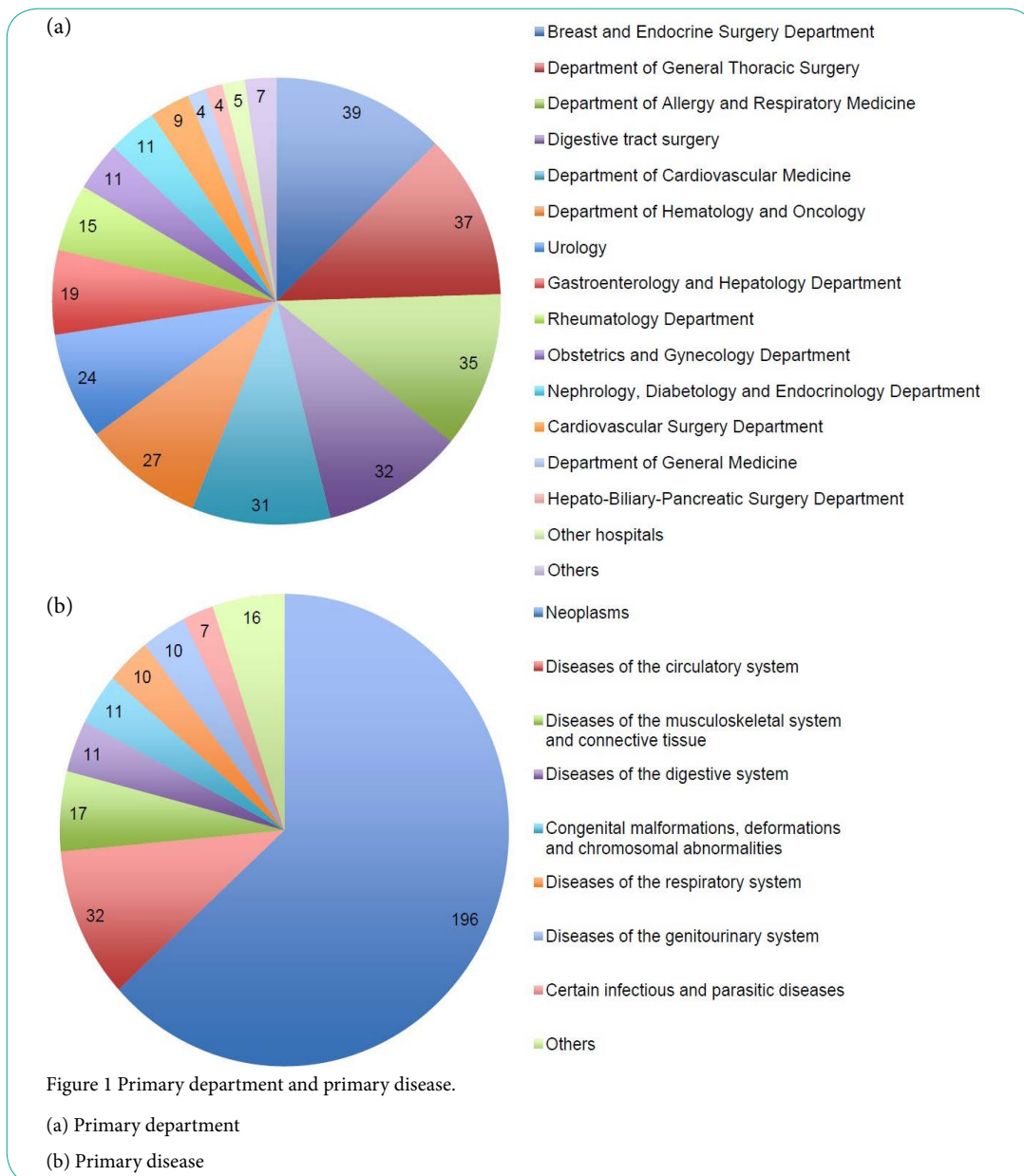


Figure 1 Primary department and primary disease.

(a) Primary department
(b) Primary disease

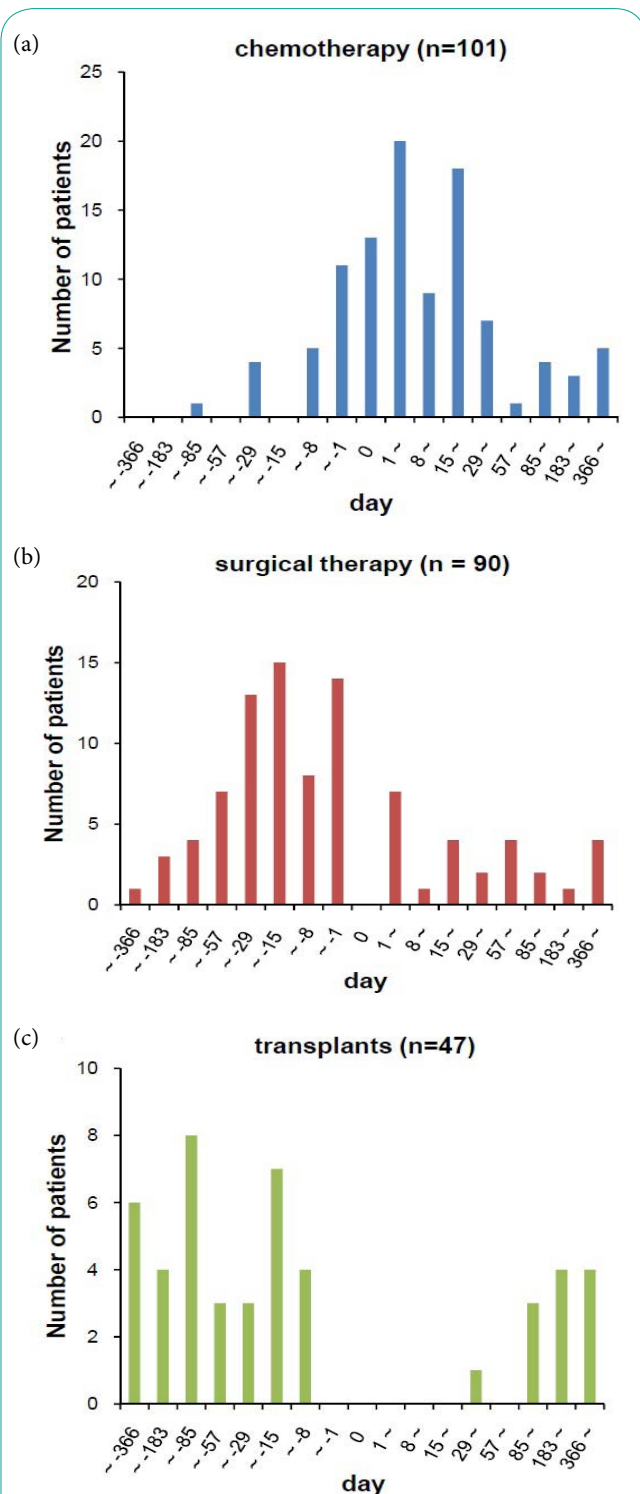


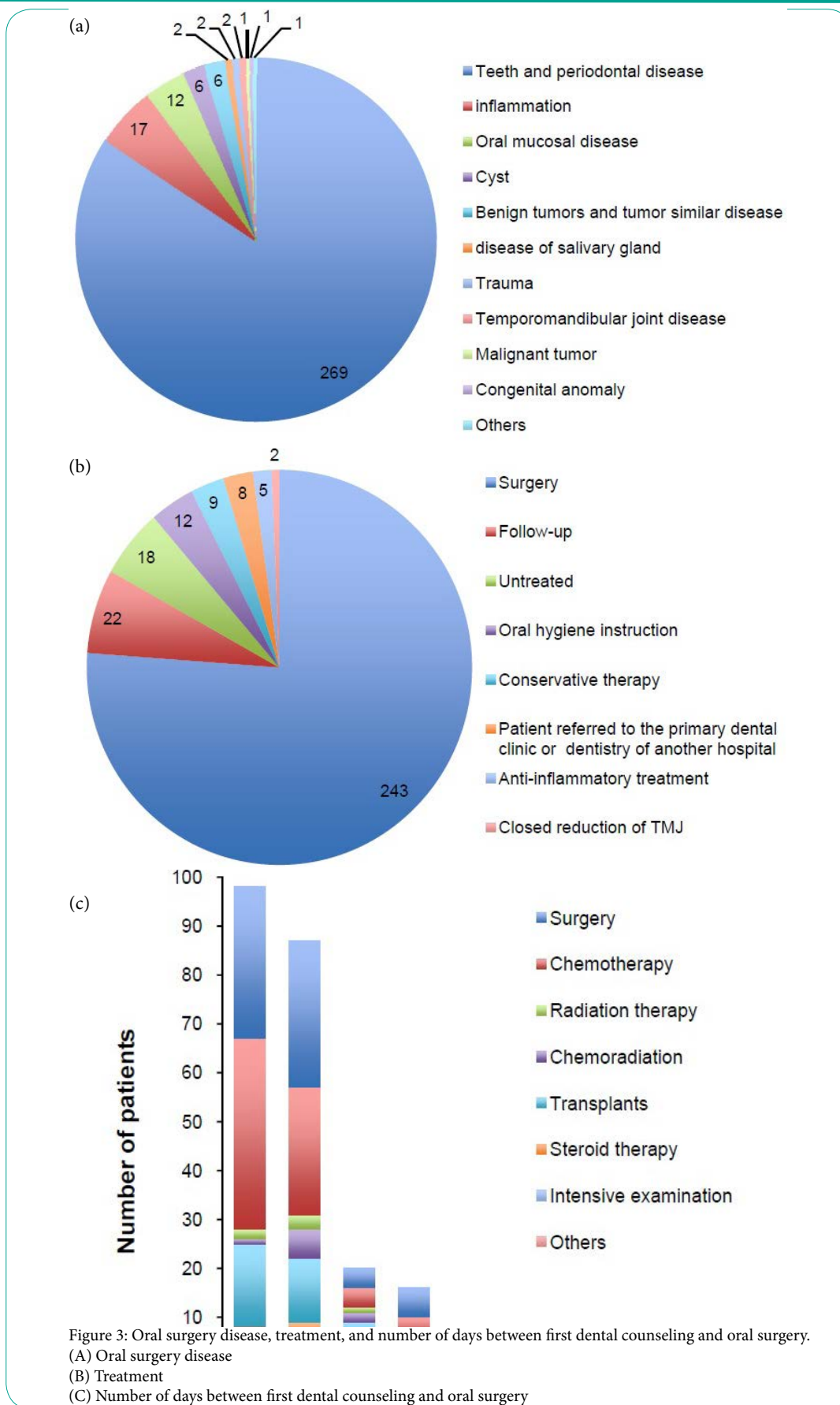
Figure 2: Main treatment for primary disease and first day of dental counseling from the start date.
 (A) The start date of chemotherapy was considered to be the first day of administration. In patients receiving dentistry before or during chemotherapy, the start date was considered to be the start date of the last course.
 (B and C) On the first day of dentistry, the start date was considered to be the day of surgery/transplantation.

The surgical diseases for which our department was consulted were most commonly diseases of the teeth and periodontal disease (269 cases), followed by inflammatory conditions such as implantitis and osteomyelitis, and mucosal diseases such as lichen planus and leukoplakia (Figure 3a). The surgical procedure performed was most often tooth extraction (243 cases); there are few cases of cystectomy and sequestrum, but it was done. We also examined the interval from the initial dental examination day to the surgical treatment date. In the majority of cases, the surgical treatment was performed on the initial examination day; in about 84% of cases, surgery was performed within 2 weeks.

Next, we investigated the use of bone resorption inhibitors and the onset of necrosis of the jaw in patients visiting our department. There were 87 cases related to the use of bone resorption inhibitors such as bisphosphonate or anti-RANKL monoclonal antibodies (Figure 4A). Of 59 patients scheduled to receive anti-resorptive drugs, we extracted teeth from 37, and these 37 patients actually received the medication after the tooth extraction. Figure 4B shows the interval from the tooth extraction to the start of the administration of bone resorption inhibitors in these 37 patients. In cases where tooth extraction was carried out multiple times, the day of the first tooth extraction was used. Depending on the original disease, bone resorption inhibitors were started either as soon as possible, i.e., about 1 week after tooth extractions in cases where the extracted tooth was completely covered; in cases in which the cavity from which the tooth was extracted required time to heal, there was a tendency to start the bone resorption inhibitors after the second week when epithelialization was complete. As shown in Table 1, in addition to cases that developed in our department after tooth extraction, a case in which tooth extraction was triggered in primary dental clinic, and cases with spontaneous onset for which our department was consulted were also included. The bone resorption inhibitor was started after tooth extraction, and the period from the start of administration to diagnosis in the 7 patients who developed ARONJ was a minimum of 65 days, a maximum of 574 days, and an average of 266 days. For the 6 cases in which dental treatment was not triggered by the underlying disease, the period from the start of administration to the diagnosis was a minimum of 188 days, a maximum of 2582 days, and an average of 1297 days. After the onset of ARONJ, drug administration was continued because these 11 cases were cancer patients, but only one case in which the drug administration was discontinued by the attending physician. Although ARONJ was conservatively treated in most cases, in 2 cases with a separated sequestrum, sequestrectomy was performed.

Discussion

In 2008, the Perioperative Management Center (PERIO) was established at Okayama University Hospital ahead of other hospitals nationwide. The PERIO includes anesthesiologists, dentists, nurses, pharmacists, physical therapists, administrative dietitians, dental hygienists, dental technicians, and clinical engineers among its staff members. The Division of Hospital Dentistry serves as a link to the medical departments and performs periodic perioperative dental interventions such as the management of oral bacteria nests, controlling intraoral infection lesions, and controlling oral mucosal disease in the perioperative periods. On the other hand, for specialized treatments and invasive treatments such as the treatment of ARONJ and oral soft tissue diseases related to oral immunity abnormalities, patients are referred to Oral and Maxillofacial Surgery from the Division of Hospital Dentistry. Regarding other dental diseases,

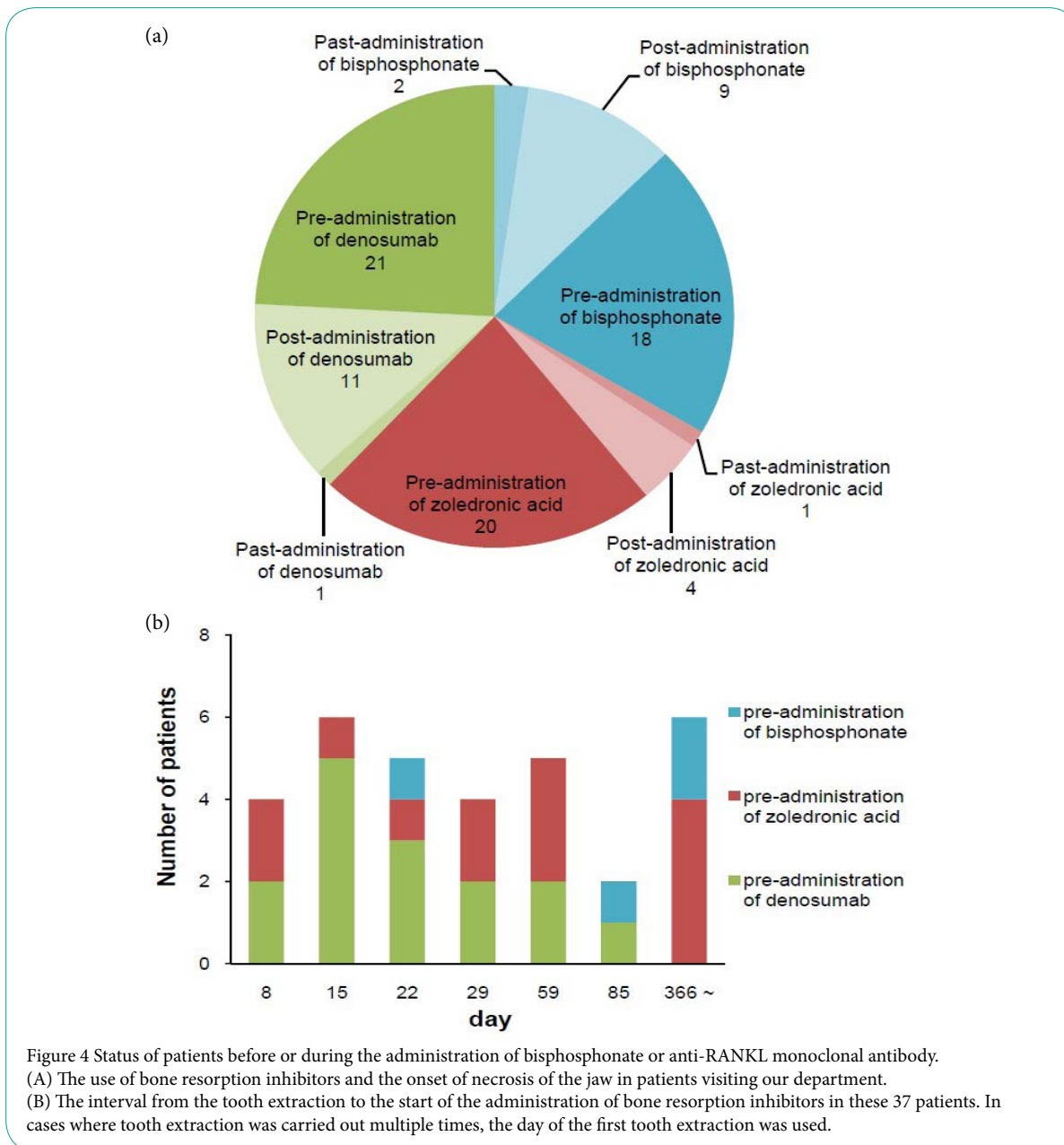


requests are made to each department according to the situation. Thus, medical-dental cooperation is supported throughout the dental system in our hospital.

Although this report is a retrospective analysis of cases in our department, cases involving the teeth and periodontal diseases account for 84% of all cases we treat, and the treatment most performed in our department is tooth extraction. Even in cases in which oral surgical treatment was necessary, there were cases exhibiting oral hygiene control and cases that became uncontrolled. When examining the causes, we performed oral hygiene management for those with poor primary disease status (12 cases), those in which the burden of the surgical procedure had a strong influence on the original disease, and those with a low risk of the influence of the treatment of the original diseases. In addition, even among cases for which treatment was scheduled, there are some cases that were not treated because of a sudden change in the physical condition of the patient (18 cases).

The cancer incidence prediction by the National Cancer Center in Japan for 2016 was 1,010,200 cases (576,100 males, 434,100 females), predicted to increase by 28,000 cases from the previous year. The 310 patients who underwent our initial examination included 176 males and 134 females who were respectively 57.2 years old and 60 years old on average. The original diseases included 196 (63%) neoplasms, with 188 of these 196 being malignant tumors. In the field of cancer treatment, phenomena such as an increase in the treatment complication rate due to various complications associated with the poor oral environment of cancer patients, the prolongation of hospital stays, the decrease in quality of life, etc., are regarded as problems, and the awareness of the importance of oral care has increased.

Also in chemotherapy or bone marrow transplantation involving anticancer drugs, the administration of a large amount of anticancer agents results in reduced neutrophils, making the patient susceptible to infection, and due to the direct action of the anticancer agents,



Main department of treatment	Main disease	Number of the days from administration start date to diagnosis	Administered drug	Administration after diagnosis of ARONJ	Surgical procedure before administration of drug	Treatment plan	
						Conservative therapy	Surgery
Department of Allergy and Respiratory Medicine	Lung cancer	188	Zoledronic acid	Discontinuation	None	o	o
Department of Hematology and Oncology	Myelodysplastic syndrome	1318	Risedronate	Continuation	None		
Department of Cardiovascular Medicine	Aortic stenosis Hypertrophic cardiomyopathy	365	Alendronate	Discontinuation	Tooth extraction	o	
Breast and Endocrine Surgery Department	Breast cancer	408	Zoledronic acid	Continuation	Tooth extraction	o	
Department of Allergy and Respiratory Medicine	Lung cancer	92	Denosumab	Continuation	Tooth extraction	o	
Gastroenterology and Hepatology Department	Liver cancer	175	Zoledronic acid	Continuation	Tooth extraction	o	
Urology	Prostatic cancer	2650	Zoledronic acid	None	Tooth extraction	o	
Digestive tract surgery	Colorectal cancer	574	Zoledronic acid	Continuation	Tooth extraction	o	
Department of Allergy and Respiratory Medicine	Breast cancer	1540	Zoledronic acid	Continuation	None	o	
Breast and Endocrine Surgery Department	Breast cancer	65	Denosumab	Continuation	Tooth extraction	o	
Department of Allergy and Respiratory Medicine	Lung cancer	1071	Zoledronic acid Denosumab	Continuation	None		o
Breast and Endocrine Surgery Department	Breast cancer	1086	Zoledronic acid Denosumab	Continuation	None	o	
Department of Allergy and Respiratory Medicine	Kidney cancer	186	Denosumab	Continuation	Tooth extraction	o	
Breast and Endocrine Surgery Department	Breast cancer	2582	Zoledronic acid	Continuation	None	o	

Table 1: Patients with anti-resorptive agents-related osteonecrosis of the jaw (ARONJ).

making the patient susceptible to infection and resulting, along with the direct action of the anticancer agents, in stomatitis. When chemotherapy is performed while a poor environment in the oral cavity is left unchecked, acute periodontal exacerbation may occur, and various oral bacteria may cause septicemia. This data showed that the transplant group consulted at the division 3 months prior to the operation, but among the chemotherapy group, many patients consulted our department within 2 weeks after chemotherapy administration. For this reason, chemotherapy patients are affected in various ways depending on the relatively tight schedule of cancer treatments, prognosis, general condition, and complications.

Furthermore, the administration of bisphosphonate and human anti-RANKL monoclonal antibody (denosumab) is effective, and these medications are widely used as bone resorption inhibitors in patients with advanced cancer with bone metastasis such as multiple myeloma, breast cancer, and prostate cancer. Jaw osteonecrosis occurs with a high frequency in association with these drugs, and it has been pointed out that even non-extracted teeth may suffer from periodontitis and dental infection. In patients receiving bone resorption inhibitors is higher than that in osteoporotic patients, and the incidence of ARONJ in patients receiving zoledronic acid or denosumab once a month has been studied in prospective studies

of cancer patients. As a result of examining 5,723 cancer patients with breast cancer, prostate cancer, other solid cancer and multiple myeloma, ARONJ has been reported in a total of 89 patients with cancer, including 52 patients (1.8%) treated with denosumab and 37 (1.3%) receiving zoledronic acid therapy [7,8]. This data also shows that zoledronic acid or denosumab was started after tooth extraction, and 7 such cases developed ARONJ at an average of 266 days and at the shortest 65 days after the start of administration. Meanwhile, in cases in which dental treatment was not an option, 6 cases exhibited the onset of ARONJ at the shortest at 188 days after the start of administration, and on average at 1297 days. These results show that in cases involving tooth extraction, the period of onset of ARONJ is shorter compared to cases without tooth extraction, and so extraction cases need to be followed more carefully.

Competing Interests

The authors declare that they have no competing interests.

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