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A study of dentists' explanations and patient-dentist communication among older adults in Japan

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Abstract

Background In recent years, the proportion of elderly people in the total patient population has been increasing owing to the rapid aging of Japanese society. However, little is known about the age-specific healthcare communication challenges within the field of dentistry. Therefore, this study aimed to examine the relationship between dentists' explanations and patient-dentist communication among elderly patients.

Methods The study included 146 dentist-elderly patient pairs from Fukuoka Prefecture, Japan. A questionnaire was administered to pairs of dentists and patients. The survey was conducted between June 2021 and April 2022. We examined the relationships among the survey items: dentist demographics, patient demographics and sufficiency of the dentist explanations, and patient-dentist communication. The logistic regression analysis was conducted to examine the patient's mode of visiting the dentist as the objective variable, sufficiency of the dentist explanations, patient-dentist communication, dentist, and patient factors as explanatory variables.

Results About 30% of patients felt that explanations of "Comparison with other treatment methods," "Treatment period," and "Treatment prognosis" were not sufficient. Among these items, a significantly higher percentage of respondents found the dentist's explanations sufficient when they were treated by more than one dentist. Many good communication factors were significantly associated with the dentist being younger and having a preventive practice. Multivariate analysis revealed a significant association between sufficiency of the dentist explanations and patients' regular dental visits.

Conclusion Adequate explanations by dentists for elderly patients were significantly associated with the dentist factor. Improving the quantity and quality of the dentists' explanations of treatment may improve patient satisfaction and promote regular dental visits.

Keywords Dentist's explanation, Patient–dentist communication, Older adults

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Introduction

According to a survey on dental care conducted in Japan in 2020, approximately 80% of respondents were satisfied with dental care, with the most common reason being "careful and good treatment," followed by "easy-to-understand explanations" [1]. In a literature review on communication in dentistry, Sondell proposed a new model for dentist-patient communication [2]. The traditional model lacks communication theory; meanwhile, the new model emphasizes the importance of events during dentist-patient encounters and explores their influence on treatment outcomes. Asimakopolou et al. discussed risk communication in dental practice and suggested that appropriate risk communication by dentists could positively impact patient health behaviors [3]. Furthermore, a study on loyalty, a measure of patient satisfaction in dental clinics, reported that the dentists' explanations of treatment choices were the most reliable predictor of such decisions [4]. Consequently, the dentists' explanations play an important role in dental care.

We examined patient-dentist communication, with a specific focus on explanatory situations during dental care [5, 6]. Our findings revealed a significant connection between sufficiency of the explanation and overall patient satisfaction [5]. Moreover, the assessments of explanations provided by dentists and dental hygienists during interprofessional dental care communication were correlated with patient satisfaction [6]. In addition, case analyses have focused on the duties of dentists [7] and doctors [8]. Approximately 60% of dentists were legally liable for a breach of duty to provide an explanation; in the field of dentistry, explanations regarding the course of treatment and medical care guidance remain lacking [7]. Furthermore, a web-based survey of the dentists' explanations was conducted [9]. Satisfaction with dentists' explanations was associated with positive impressions of dentists and regular dental visits for preventive purposes [9]. However, the International Social Survey Program conducted a survey and comparison in 2011 in various countries and reported that in Japan, although patients acknowledge the treatment skills of doctors (dentists are not included), their assessment of medical communication is comparatively lower than that in other countries [10]. Therefore, further improvements in dental communication are required.

In recent years, the landscape of medical and dental care in Japan has changed owing to an aging population. Levinson et al. reported age-related differences in communication, noting a more negative attitude in patients aged 45 years and older compared with those in younger age groups [11]. However, older patients tended to actively seek more information and engage in decision-making [12]. Giampieri et al. examined the differences in communication between older and younger patients, emphasizing the importance of providing appropriate informed consent for older patients [13]. In Japan, guidelines for the appropriate provision of healthcare to older people have been proposed [14]. However, their implementation in actual medical practice remains limited. Mukheriee et al. highlighted the limited research reporting the necessity of informed consent for older patients in dentistry, highlighting the limited availability of information [15]. In our web-based survey, older people reported higher satisfaction with the dental care explanations compared with other age groups [9]; however, an investigation in real clinical dental situations has not yet been undertaken.

Therefore, this study aimed to focus on the dentists' explanations in dental care and was to clarify dentists' explanations and dentist-elderly patient communication in the actual medical practice.

Methods

Participants

The study included dentists and patients in dental clinics in Fukuoka Prefecture who agreed to the study objective and were willing to participate. A survey was conducted in 19 dental clinics, targeting 10 elderly patients in each clinic. Questionnaires were administered to 154 patients (recovery rate, 81.1%). Three dental clinics with a recovery rate of <40% were excluded due to their potential influence on dental clinic factors and questionnaires missing data were excluded. Consequently, the analysis included data of 146 patients from 16 dental clinics.

The dentists' demographic information, such as age, sex, and practice, were evaluated. Meanwhile, the patient's demographic data included age, sex, number of household members, household income, Dementia Assessment Sheet for Community-based Integrated Care System 8-items (DASC-8) score [16], reasons for choosing the current dental clinic, and frequency of clinic visits (regular (for preventive purposes) or irregular (prompted solely by the presence of pain or specific problems)). Of these, the DASC-8, in principle, is assessed by questioning the participant's family or caregivers [16]. However, in this study, patients answered the questionnaire outside the dental clinic, and detailed instructions were difficult to provide; therefore, the questionnaire was self-administered.

Procedures

A questionnaire was administered to the dentists and patients in pairs. The survey was conducted from June 2021 to April 2022. Hamasaki explained the purpose and methods of the survey to each dentist at the dental clinic. The dentist provided a questionnaire package to patients who visited the dental clinic. The dentists received information about the content and methods of explaining the

procedures to the patients. The patients were instructed to complete the survey outside the dental clinic to ensure that the presence of a dentist did not influence their responses. Following the completion of each questionnaire, the patients returned it by mail. Both dentists and patients filled out identical questionnaires detailing their experiences, and subsequently submitted the completed questionnaires by mail.

Measures

First, the extent of explanation provided by the dentist to the patient for each situation was assessed. Specifically, the explanations included the "disease name," "disease condition," "examination methods and results," "treatment methods and effects," "side effects and risks of treatment," "comparison with other treatment methods," "treatment period," and "treatment prognosis." Each patient rated these items on a five-point Likert scale, with scores ranging from 1 (*very insufficient*) to 5 (*very sufficient*) and neither, not applicable, no response. For your information, examples of disease names included in this study are as follows: caries, dentures, periodontal disease, prosthodontics, extractions, preservation, etc.

In terms of the communication factors, the patients were asked to rate the following six items that assess their dentist's communicative behaviors: "My dentist is friendly," "My dentist tries to talk to me," "My dentist tries to listen to me," "My dentist shows interest when I talk," "Treatment time is too short," and "It is easy to ask my dentist questions." The items were rated from 1 (*strongly disagree*) to 5 (*strongly agree*).

Table 1 Demographics related to dentists and patients

Dentist demographics (*N* = 16)		***N*(%) / Mean ± SD**
Sex	Male	14(87.5)
	Female	2(12.5)
Age (years)		52.3 ± 8.0
Clinical experience (years)		26.9 ± 8.1
Number of dentists	1	8(50.0)
	2 or more	8(50.0)
Number of patients per dentist (persons)		32.0 ± 17.2
Type of dental practice	Treatment only	7(43.8)
	Treatment+prevention	9(56.2)
Patient demographics (*N* = 146)		
Sex	Male	63(43.2)
	Female	83(56.8)
Age (years)		74.9 ± 6.7
Family structure	Lives alone	32(21.9)
	Other	114(78.1)
Number of household members (persons)		2.2 ± 1.1
Dementia Assessment Sheet for Community-based Integrated Care System 8-items (DASC-8)	Category I	120(82.2)
	Category II, III	26(17.8)
Household income	< 2,000,000 yen, Unknown	42(28.8)
	2,000,000 yen – < 4,000,000 yen	74(50.7)
	> 4,000,000 yen	30(20.5)
Reasons for choosing current dental clinic (% of yes)	Good reputation for treatment techniques	46(31.5)
	Recommended by family or acquaintances	36(24.7)
	Good attitude of dentist and staff	58(39.7)
	Close to home or place of work	68(46.6)
Visits to the dental clinic	Irregular	44(30.1)
	Regular and irregular	102(69.9)

Category I: Normal and independent; Category II, III: Mild dementia or ADL decline, moderate or higher dementia or ADL decline, and no response

Data analysis

The patients' evaluation of the dentist's explanation was classified into two groups: "sufficient, very sufficient" and "no explanation, very insufficient, insufficient, neither, not applicable, no response."

The communication factor was classified into two groups: "agree, very agree" and "neither agree nor disagree, and not so much and disagree. Furthermore, an χ^2 test or Fisher's exact probability test was employed to assess the association between a dentist's explanation and communication factors, as well as factors involving both dentists and patients.

Finally, a logistic regression analysis was conducted to examine the patient's mode of visiting the dentist as the objective variable and explanatory evaluation, sufficiency of the dentist explanations, the dentist's communication attitude, dentist, and patient factors as explanatory variables. In analyzing, the total score for all eight explanation items was calculated, with "sufficient and very sufficient" assigned a score of 1 and all others assigned a score of 0. Similarly, the total score for all six communication items was calculated, with "strongly and somewhat agree", a score of 1 was given for "strongly and somewhat agree" assigned a score of 1 and all others assigned a score of 0. ("treatment time is too short" was treated as a reversed item). PASW Statistics for Mac version 25 was used for performing statistical analyses.

Results

Participant's demographic data

The data of dentists and patients included in the study are listed in Table 1. Of the 16 dentists, 14 were men and two were women. The mean age was 52.3 ± 8.0 years, and the mean clinical experience was 26.9 ± 8.1 years. In terms of the distribution of dentists in the dental clinics, 8 (50.0%) clinics had 1 dentist, while 9 (56.2%) clinics had 2 or more dentists. Among the surveyed clinics, 7 (43.8%)

focused exclusively on treatment, while nine (56.2%) were engaged in both treatment and prevention.

Of 146 patients, 63 (43.2%) were men and 83 (56.8%) were women. The mean age of the patients was 74.9±6.7 years. Cognitive and daily living functions were evaluated using the DASC-8 scale; 120 (82.2%) patients were classified into category I (normal and independent), while 26 (17.8%) patients were classified into categories II and III (mild dementia or ADL decline, moderate or higher dementia or ADL decline) [16]. The majority of respondents, 74 individuals (50.7%), reported a household income of JPY 2–4 million. In terms of the reasons for choosing their current dental practice, 46 (31.5%) individuals reported a good reputation for treatment techniques, 58 (39.7%) considered the positive attitude of the dentists and staff, and 68 (46.6%) mentioned its proximity to their home or workplace. With regard to the frequency of visits to dental clinics, 102 (69.9%) respondents were regular attendees for preventive purposes, while the rest were both regular and irregular attendees.

Table 2 Patient evaluations of the dentist explanations and communication factors

Explanation content		***N*(%)**
1 Disease name	Other*	17(11.6)
	Sufficient, very sufficient	129(88.4)
2 Disease condition	Other*	19(13.0)
	Sufficient, very sufficient	127(87.0)
3 Examination method and results	Other*	21(14.4)
	Sufficient, very sufficient	125(85.6)
4 Treatment methods and effects	Other*	26(17.8)
	Sufficient, very sufficient	120(82.2)
5 Side effects and risks of the treatment	Other*	34(23.3)
	Sufficient, very sufficient	112(76.7)
6 Comparison with other treatment methods	Other*	47(32.2)
	Sufficient, very sufficient	99(67.8)
7 Treatment period	Other*	40(27.4)
	Sufficient, very sufficient	106(72.6)
8 Treatment prognosis	Other*	36(24.7)
	Sufficient, very sufficient	110(75.3)
Communication factors		
1 My dentist is friendly	Agree	123(85.4)
	Disagree	21(14.6)
2 My dentist tries to talk to me	Agree	109(75.7)
	Disagree	35(24.3)
3 My dentist tries to listen to me	Agree	121(84.0)
	Disagree	23(16.0)
4 My dentist shows interest when I talk	Agree	115(81.6)
	Disagree	26(18.4)
5 Treatment time is too short	Agree	19(13.8)
	Disagree	119(86.2)
6 It is easy to ask my dentist a question	Agree	104(73.8)
	Disagree	37(26.2)

*Other: No explanation or very insufficient, insufficient, neither, not applicable, no response

Patients' evaluation of the dentist's explanation and communication

Patient evaluations of the dentists' explanations are shown in Table 2. A total of 129 (88.4%) patients' answered that the explanation regarding the "disease name," was "sufficient or very sufficient," 127 (87.0%) answered that the explanation regarding the "disease condition," was "sufficient or very sufficient," 125 (85.6%) answered that the explanation regarding the "examination methods and results" was "sufficient or very sufficient," 120 (82.2%) answered that the explanation regarding the "treatment methods and results" was "sufficient or very sufficient," 112 (76.7%) answered that the explanation regarding the "side effects and risks of the treatment" was "sufficient or very sufficient," 99 (67.8%) answered that the explanation regarding the "comparison with other treatment methods" was "sufficient or very sufficient," 106 (72.6%) answered that the explanation regarding the "treatment period" was "sufficient or very sufficient," and 110 (75.3%) answered that the explanation regarding the "treatment prognosis" was "sufficient or extremely sufficient."

Table 2 shows patient evaluations of the dentist' communication factors. A total of 123 (85.4%) patients' answered that regarding the "my dentist is friendly", was "strongly agree or agree," 109 (75.7%) answered that regarding the "my dentist tries to talk to me", was "strongly agree or agree," 121(84.0%) answered that regarding the "my dentist tries to listen to me, was "strongly agree or agree," 115 (81.6%) answered that regarding the "my dentist shows interest when I talk", was "strongly agree or agree," 119 (86.2%) answered that regarding the "treatment time is too short", was "strongly disagree or disagree," and 104 (73.8%) answered that regarding the "it is easy to ask my dentist a question", was "strongly agree or agree."

Patient and dentist attributes in relation to dentist explanation

The associations between patient-dentist attributes and dentist explanation are shown in Table 3. Table 3 shows the four items for which more than 80% of the patients answered that the explanations were sufficient. The

Table 3 Relationship between patient and dentist and dentist explanations

Factor		Disease name			Disease condition			Examination method and results			Treatment methods and effects		
		Sufficient, very sufficient	Other*	*P*-value	Sufficient, very sufficient	Other*	*P*-value	Sufficient, very sufficient	Other*	*P*-value	Sufficient, very sufficient	Other*	*P*-value
Dentist													
Dentist Sex	Male	111(86.0)	17(100)	0.093	109(85.8)	19(100)	0.068	107(85.6)	21(100)	0.050	103(85.8)	25(96.2)	0.127
	Female	18(14.0)	0(0)		18(14.2)	0(0)		18(14.4)	0(0)		17(14.2)	1(3.8)	
Dentist Age (years)		52.0 ± 7.7	56.7 ± 8.1	0.021	51.7 ± 7.7	57.5 ± 6.9	0.002	51.7 ± 7.6	57.3 ± 7.6	0.002	51.3 ± 7.5	58.0 ± 7.2	< 0.001
Clinical experience (years)		26.7 ± 7.7	30.9 ± 8.0	0.052	26.5 ± 7.8	31.7 ± 7.0	0.008	26.4 ± 7.6	31.9 ± 7.6	0.003	26.0 ± 7.5	32.7 ± 7.1	< 0.001
Number of dentists	1	58(45.0)	13(76.5)	0.014	54(42.5)	17(89.5)	< 0.001	55(44.0)	16(76.2)	0.006	49(40.8)	22(84.6)	< 0.001
	2 or more	71(55.0)	4(23.5)		73(57.5)	2(10.5)		70(56.0)	5(23.8)		71(59.2)	4(15.4)	
Number of patients per dentist (persons)		34.0 ± 16.5	23.0 ± 13.3	0.012	34.4 ± 16.4	21.4 ± 12.7	< 0.001	34.4 ± 16.3	23.1 ± 15.1	0.002	35.4 ± 16.3	21.0 ± 11.4	< 0.001
Type of dental practice	Treatment only	53(41.1)	9(52.9)	0.353	51(40.2)	11(57.9)	0.145	51(40.8)	11(52.4)	0.320	48(40.0)	14(53.8)	0.195
	Treatment+Prevention	76(58.9)	8(47.1)		76(59.8)	8(42.1)		74(59.2)	10(47.6)		72(60.0)	12(46.2)	
Patient													
Patient Sex	Male	54(41.9)	9(52.9)	0.386	54(42.5)	9(47.4)	0.691	49(39.2)	14(66.7)	0.019	50(41.7)	13(50.0)	0.437
	Female	75(58.1)	8(47.1)		73(57.5)	10(52.6)		76(60.8)	7(33.3)		70(58.3)	13(50.0)	
Patient Age (years)		74.9 ± 6.6	74.4 ± 7.3	0.549	75.0 ± 6.7	74.0 ± 6.8	0.433	74.8 ± 6.6	75.1 ± 7.1	0.962	75.1 ± 6.8	73.9 ± 6.0	0.420
Family structure	Lives alone	26(20.2)	6(35.3)	0.156	25(19.7)	7(36.8)	0.092	26(20.8)	6(28.6)	0.426	24(20.0)	8(30.8)	0.229
	Other	103(79.8)	11(64.7)		102(80.3)	12(63.2)		99(79.2)	15(71.4)		96(80.0)	18(69.2)	
Number of household members (persons)		2.2 ± 1.1	1.9 ± 1.0	0.220	2.2 ± 1.1	2.1 ± 1.1	0.403	2.2 ± 1.1	2.1 ± 1.0	0.629	2.2 ± 1.0	2.2 ± 1.2	0.499
Household income	< 2,000,000 yen	33(26.8)	3(17.6)	0.314	32(26.4)	4(21.1)	0.427	32(26.9)	4(19.0)	0.322	31(26.7)	5(20.8)	0.375
	≧ 2,000,000 yen	90(73.2)	14(82.4)		89(73.6)	15(78.9)		87(73.1)	17(81.0)		85(73.3)	19(79.2)	
DASC-8	Category I	105(82.0)	15(88.2)	0.407	106(84.1)	14(73.7)	0.207	105(84.7)	15(71.4)	0.137	99(83.2)	21(80.8)	0.480
	Category II, III	23(18.0)	2(11.8)		20(15.9)	5(26.3)		19(15.3)	6(28.6)		20(16.8)	5(19.2)	
Visits to the dental clinic	Irregular	36(27.9)	8(47.1)	0.106	34(26.8)	10(52.6)	0.022	33(26.4)	11(52.4)	0.016	32 (26.7)	12(46.2)	0.050
	Regular and both	93(72.1)	9(52.9)		93(73.2)	9(47.4)		92(73.6)	10(47.6)		88(73.3)	14(53.8)	
Reasons for choosing current dental clinic (% of yes)	Good reputation for treatment techniques	44(34.1)	2(11.8)	0.050	44(34.6)	2(10.5)	0.026	44(35.2)	2(9.5)	0.013	42(35.0)	4(15.4)	0.038
	Good attitude of dentist and staff	52(40.3)	6(35.3)	0.691	54(42.5)	4(21.1)	0.060	54(43.2)	4(19.0)	0.029	50(41.7)	8(30.8)	0.303
	Close to home or place of work	56(43.4)	12(70.6)	0.032	55(43.3)	13(68.4)	0.041	56(44.8)	12(57.1)	0.294	52(43.3)	16(61.5)	0.092

*Other: No explanation or very insufficient, insufficient, neither, not applicable, no response

explanation contents was rated as "sufficient, very sufficient" and "other," and an χ^2 test or Fisher's exact probability test was conducted.

The findings revealed that among the patients who answered "sufficient" for the explanation of "disease name," the mean age of the dentists was significantly lower ($p=0.021$) and the mean number of patients was significantly higher ($p=0.012$). Additionally, had more than two dentists ($p=0.014$) and a significantly lower proportion of them chose their current dental practice based on close home or place of work ($p=0.032$).

In the group of respondents who answered "sufficient" for the explanation of "disease condition," the mean age of the dentists was significantly lower ($p=0.002$), the dentists had less years of clinical experience ($p=0.008$), and the mean number of patients was significantly higher ($p<0.001$). Additionally, had more than two dentists ($p<0.001$), a significantly higher proportion of patients visited the clinic regularly ($p=0.022$), and a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques ($p=0.026$), and a home or place of work ($p=0.041$).

In the group of respondents who answered "sufficient" for the explanation of "examination method and results" were the mean age of the dentists was significantly lower ($p=0.002$), the dentists had less years of clinical experience ($p=0.003$), and the mean number of patients was significantly higher ($p=0.002$). Additionally, had more than two dentists ($p=0.006$), a significantly higher proportion of patients visited the clinic regularly ($p=0.016$), and a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques ($p=0.013$), the positive attitudes of the dentist and staff ($p=0.029$).

In the group of respondents who answered "sufficient" for the explanation of "treatment methods and effects" were the mean age of the dentists was significantly lower ($p<0.001$), x ($p<0.001$), and the mean number of patients was significantly higher ($p<0.001$). Additionally, had more than two dentists ($p<0.001$), and a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques ($p=0.038$).

Table 4 shows the four items for which less than 80% of the patients answered that the explanations were sufficient. The findings revealed that among the patients who answered "sufficient" for the explanation of "side effects and risk of the treatment," the mean age of the dentists was significantly lower ($p=0.010$) and the dentists had less years of clinical experience ($p=0.017$), the mean number of patients was significantly higher ($p<0.001$). Additionally, their dentists were women ($p=0.006$), had more than two dentists ($p<0.001$) and a significantly higher proportion of patients visited the clinic regularly ($p=0.004$), a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques($p=0.011$) and a significantly lower proportion chose their current dental practice based on close home or place of work($p=0.005$).

In the group of respondents who answered "sufficient" for the explanation of "comparison with other treatment methods," the mean age of the dentists was significantly lower ($p=0.008$) and the dentists had less years of clinical experience($p=0.014$), the mean number of patients was significantly higher ($p<0.001$). Additionally, their dentists were women($p<0.001$) and had more than two dentists ($p<0.001$) and a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques($p<0.001$), the positive attitudes of the dentist and staff($p=0.016$), and a significantly lower proportion of them chose their current dental practice based on close home or place of work($p=0.030$).

In the group of respondents who answered "sufficient" for the explanation of "treatment period," the mean age of the dentists was significantly lower ($p=0.038$) and the mean number of patients was significantly higher ($p<0.001$). Additionally, their dentists were women ($p=0.018$), had more than two dentists ($p<0.001$), and a significantly higher proportion of patients visited the clinic regularly ($p=0.016$), and a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques($p<0.001$), the positive attitudes of the dentist and staff($p=0.025$), and a significantly lower proportion of them chose their current dental practice based on close home or place of work($p=0.046$).

In the group of respondents who answered "sufficient" for the explanation of "treatment prognosis," the mean age of the dentists was significantly lower ($p=0.002$) and the dentists had less years of clinical experience ($p=0.003$), the mean number of patients was significantly higher ($p<0.001$). Additionally, their dentists were women ($p=0.033$), had more than two dentists ($p<0.001$), and a significantly higher proportion of patients visited the clinic regularly ($p=0.010$), and a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques($p=0.001$), and a significantly lower proportion of them chose their current dental practice based on close home or place of work($p=0.016$).

Patient and dentist attributes in relation to dentist communication factors

The associations between patient-dentist attributes and dentist communication factors are shown in Table 5. Each communication factor was rated as "agree" and "disagree,"

Table 4 Relationship between patient and dentist and dentist explanations

Factor		Side effects and risks of the treatment			Comparison with other treatment methods			Treatment period			Treatment prognosis		
		Sufficient, very sufficient	Other*	*P*-value	Sufficient, very sufficient	Other*	*P*-value	Sufficient, very sufficient	Other*	P値	Sufficient, very sufficient	Other*	*P*-value
Dentist													
Dentist Sex	Male	94(83.9)	34(100)	0.006	81(81.8)	47(100)	< 0.001	89(84.0)	39(97.5)	0.018	93(84.5)	35(97.2)	0.033
	Female	18(16.1)	0(0)		18(18.2)	0(0)		17(16.0)	1(2.5)		17(15.5)	1(2.8)	
Dentist Age (years)		51.6 ± 7.7	55.4 ± 7.7	0.010	51.3 ± 7.5	55.0 ± 7.9	0.008	51.7 ± 7.6	54.7 ± 8.1	0.038	51.3 ± 7.4	56.1 ± 8.1	0.002
Clinical experience (years)		26.3 ± 7.7	30.0 ± 7.7	0.017	26.0 ± 7.5	30.0 ± 8.0	0.014	26.4 ± 7.6	29.2 ± 8.1	0.075	26.0 ± 7.4	30.1 ± 8.1	0.003
Number of dentists per dentist	1	45(40.2)	26(76.5)	< 0.001	40(40.4)	31(66.0)	0.004	41(38.7)	30(75.0)	< 0.001	44(40.0)	27(75.0)	< 0.001
	2 or more	67(59.8)	8(23.5)		59(59.6)	16(34.0)		65(61.3)	10(25.0)		66(60.0)	9(25.0)	
Number of patients (persons)		35.0 ± 16.4	25.2 ± 14.9	0.002	36.6 ± 16.9	24.7 ± 12.6	< 0.001	35.7 ± 16.7	25.0 ± 13.5	< 0.001	36.1 ± 16.3	22.5 ± 12.8	< 0.001
Type of dental practice	Treatment only	45(40.2)	17(50.0)	0.310	43(43.4)	19(40.4)	0.731	43(40.6)	19(47.5)	0.450	45(40.9)	17(47.2)	0.506
	Treatment+Prevention	67(59.8)	17(50.0)		56(56.6)	28(59.6)		63(59.4)	21(52.5)		65(59.1)	19(52.8)	
Patient													
Patient Sex	Male	44(39.3)	19(55.9)	0.087	40(40.4)	23(48.9)	0.331	41(38.7)	22(55.0)	0.076	43(39.1)	20(55.6)	0.083
	Female	68(60.7)	15(44.1)		59(59.6)	24(51.1)		65(61.3)	18(45.0)		67(60.9)	16(44.4)	
Patient Age (years)		74.7 ± 6.6	75.3 ± 6.8	0.721	75.3 ± 6.9	74.0 ± 6.2	0.252	75.1 ± 6.8	74.2 ± 6.3	0.418	75.1 ± 6.8	74.2 ± 6.3	0.487
Family structure	Lives alone	24(21.4)	8(23.5)	0.795	22(22.2)	10(21.3)	0.897	24(22.6)	8(20.0)	0.731	25(22.7)	7(19.4)	0.679
	Other	88(78.6)	26(76.5)		77(77.8)	37(78.7)		82(77.4)	32(80.0)		85(77.3)	29(80.6)	
Number of household members (persons)		2.2 ± 1.0	2.2 ± 1.2	0.940	2.2 ± 1.0	2.3 ± 1.2	0.822	2.2 ± 1.0	2.3 ± 1.1	0.628	2.2 ± 1.1	2.3 ± 1.1	0.345
Household income	< 2,000,000 yen	28(25.9)	8(25.0)	0.916	28(28.6)	8(19.0)	0.237	27(26.2)	9(24.3)	0.822	28(26.4)	8(23.5)	0.738
	≧ 2,000,000 yen	80(74.1)	24(75.0)		70(71.4)	34(81.0)		76(73.8)	28(75.7)		78(73.6)	26(76.5)	
DASC-8	Category I	94(84.7)	26(76.5)	0.267	83(84.7)	37(78.7)	0.373	89(84.8)	31(77.5)	0.301	92(84.4)	28(77.8)	0.362
	Category II, III	17(15.3)	8(23.5)		15(15.3)	10(21.3)		16(15.2)	9(22.5)		17(15.6)	8(22.2)	
Visits to the dental clinic	Irregular	27(24.1)	17(50.0)	0.004	25(25.3)	19(40.4)	0.062	26(24.5)	18(45.0)	0.016	27(24.5)	17(47.2)	0.010
	Regular and both	85(75.9)	17(50.0)		74(74.7)	28(59.6)		80(75.5)	22(55.0)		83(75.5)	19(52.8)	
Reasons for choosing current dental clinic (% of yes)	Good reputation for treatment techniques	41(36.6)	5(14.7)	0.011	41(41.4)	5(10.6)	< 0.001	42(39.6)	4(10.0)	< 0.001	42(38.2)	4(11.1)	0.001
	Good attitude of dentist and staff	48(42.9)	10(29.4)	0.161	46(46.5)	12(25.5)	0.016	48(45.3)	10(25.0)	0.025	48(43.6)	10(27.8)	0.091
	Close to home or place of work	45(40.2)	23(67.6)	0.005	40(40.4)	28(59.6)	0.030	44(41.5)	24(60.0)	0.046	45(40.9)	23(63.9)	0.016

*Other: No explanation or very insufficient, insufficient, neither, not applicable, no response

and an χ^2 test or Fisher's exact probability test was conducted. The findings revealed that among the patients who answered "agree" to the statement "My dentist is friendly," their dentists were women ($p=0.048$), had more than two dentists ($p=0.006$), and provided both treatment and prevention ($p=0.011$). Additionally, patients in this group were more inclined to have regular dental visits ($p=0.019$), and a significantly higher proportion of them chose their current dental practice based on its good reputation for treatment techniques ($p=0.012$) and the positive attitudes of the dentist and staff ($p=0.025$). In the group of respondents who answered "agree" to the statement "My dentist is friendly," the mean age of the dentists was significantly lower ($p=0.004$), the dentists had fewer years of experience ($p=0.015$), the mean number of patients was significantly higher ($p=0.003$), and the patients were significantly older ($p=0.023$).

Second, in the group of respondents who answered "agree" to the statement "My dentist tries to talk to me," a significantly higher proportion had a female dentist ($p=0.005$) and chose their current dental practice due to its good reputation for treatment techniques ($p=0.012$). The dentists were also significantly younger ($p=0.003$), had fewer years of experience ($p=0.008$), and had a significantly higher average number of patients ($p<0.001$). In the group of respondents who answered "agree" to the statement "My dentist tries to listen to me," a significantly higher proportion had female dentists ($p=0.035$) and had more than two dentists ($p=0.028$). A significantly higher proportion of patients visited the clinic regularly ($p=0.003$) and chose their current dental practice due to its good reputation for treatment techniques ($p=0.007$). The dentists were also significantly younger ($p<0.001$), had fewer years of experience ($p=0.028$), and had a significantly higher average number of patients ($p=0.001$).

In the group of respondents who answered "yes" to the statement "My dentist shows interest when I talk," a significantly higher proportion had a female dentist ($p=0.019$) and more than two dentists ($p=0.022$). A significantly higher proportion of respondents chose their current dental practice due to its good reputation for treatment techniques ($p=0.002$). The average age of the dentists was significantly lower ($p=0.017$), the dentists had fewer years of experience ($p=0.035$), and the dentists had a significantly higher average number of patients ($p=0.003$).

In the group of respondents who answered "agree" to the statement "Treatment time is too short," a significantly lower proportion had more than one dentist ($p=0.010$), their dentists had a higher mean age ($p=0.023$), and their dentist had more years of experience ($p=0.026$). In the group of respondents who answered "yes" to the statement " It is easy to ask my dentist a question," the dentists were women ($p=0.024$), the dentists had a significantly higher average number of patients ($p=0.001$), and they chose their current dental practice due to its good reputation for treatment techniques ($p=0.017$).

Multivariate analysis with dentist communication factors as objective variables

To assess whether the explanatory factors of dentists and the communication factors of dentists were involved in whether the patient regularly or irregularly visits the dentist, logistic regression analysis was conducted with visits to the dental clinic assigned as objective variables (Table 6). The dentist-related factors such as the dentist sex, dentist age, and the patient-related factor such as the household income and DASC-8 were considered explanatory variables. In addition, the total scores of the eight explanatory content items and the total scores of the six communication factors were used as explanatory variables, and since these two were strongly related, they were analyzed in separate models. Patients' low income, with an adjusted OR of 3.971 (95%CI: 1.649–9.563 $p=0.002$) and total score for patient of dentists' explanations with an adjusted OR of 1.219 (95%CI: 1.020–1.360 $p=0.009$) are significantly associated with patients' regular dental visits. here was no significant association between communication factors and visits to the dentist.

Discussion

Influence of dentists' explanations and patient-requested explanations

The present study focused on dentists' explanations in dental care and aimed to clarify dentist's explanations and patient-dentist communication in clinical dental care settings with elderly patients. The results of this study showed that the dentist's explanation is influenced by the dentist's factors and were significantly associated with the patient outcome: regular dental visits. In the present study, the content of the explanations covered eight items, and the adequacy of the explanation of each item was assessed. First, we examined the content of the explanations. In this study, around 30% of the patients reported that the explanations were insufficient, particularly in the items "comparison with other treatment methods," "treatment period," and "treatment prognosis." This inadequacy was more prevalent in these three areas compared with other aspects. Interestingly, these three items were consistently identified as needing more explanation in our previous web survey of dental clinics [9]. This suggests that these items may be insufficiently explained. In particular, a significantly higher proportion of patients aged≥40 years expressed a higher desire for "comparison with other treatment options" to be explained to them compared with their younger counterparts. This underscores the significance of enhancing

Table 5 Relationship between patient and dentist and communication factors

Factor		My dentist is friendly			My dentist tries to talk to me			My dentist tries to listen to me			My dentist shows interest when I talk			Treatment time is too short			It is easy to ask my dentist a question		
		Agree	Disagree	*P*-value	Agree	Disagree	*P*-value	Agree	Disagree	*P*-value	Agree	Disagree	*P*-value	Agree	Disagree	*P*-value	Agree	Disagree	*P*-value
Dentist Sex	Male	105(85.4)	21(100)	0.048	91(83.5)	35(100)	0.005	103(85.1)	23(100)	0.035	97(84.3)	26(100)	0.019	19(100)	101(84.9)	0.057	87(83.7)	36(97.3)	0.024
	Female	18(14.6)	0(0)		18(16.5)	0(0)		18(14.9)	0(0)		18(15.7)	0(0)		0(0)	18(15.1)		17(16.3)	1(2.7)	
Dentist Age (years)		51.2 ± 7.5	57.1 ± 8.2	0.004	51.4 ± 7.2	56.3 ± 8.2	0.003	51.2 ± 7.5	57.5 ± 8.0	< 0.001	51.7 ± 7.6	55.7 ± 7.9	0.017	56.3 ± 6.4	51.9 ± 7.9	0.023	52.0 ± 7.4	53.7 ± 8.6	0.294
Clinical experience (years)		26.6 ± 7.6	31.1 ± 8.2	0.015	26.2 ± 7.3	30.1 ± 8.7	0.008	26.4 ± 7.6	31.7 ± 7.9	0.003	26.6 ± 7.7	29.7 ± 7.9	0.035	30.6 ± 6.7	26.6 ± 7.8	0.026	26.7 ± 7.5	28.0 ± 8.5	0.398
Number of dentists	1	54(43.9)	16(76.2)	0.006	48(44.0)	22(62.9)	0.053	54(44.6)	16(69.6)	0.028	51(44.3)	18(69.2)	0.022	14(73.7)	50(42.0)	0.010	45(43.3)	22(59.5)	0.090
	2 or more	49(56,1)	5(23.8)		61(56.0)	13(37.1)		67(55.4)	7(30.4)		64(55.7)	8(30.8)		5(26.3)	69(58.0)		59(56.7)	15(40.5)	
Number of patients per dentist (persons)		34.4 ± 16.5	23.1 ± 14.2	0.003	36.0 ± 16.4	22.5 ± 13.0	< 0.001	34.7 ± 16.5	22.7 ± 13.6	0.001	34.7 ± 16.8	24.3 ± 13.0	0.003	27.2 ± 15.7	34.4 ± 16.6	0.079	35.5 ± 17.2	26.6 ± 12.6	0.001
Type of dental practice	Treatment only	47(41.2)	15(71.4)	0.011	43(43.0)	19(54.3)	0.249	48(42.9)	14(60.9)	0.114	48(45.3)	13(50.0)	0.666	9(50.0)	50(45.0)	0.695	44(45.8)	16(44.4)	0.887
	Treatment+Prevention	67(58.8)	6(28.6)		57(57.0)	16(45.7)		64(57.1)	9(30.1)		58(54.7)	13(50.0)		9(50.0)	61(55.0)		52(54.2)	20(55.6)	
Patient Sex	Male	52(42.3)	9(42.9)	0.960	47(43.1)	14(40.0)	0.745	52(43.0)	10(43.5)	0.964	50(43.5)	10(38.5)	0.640	11(57.9)	48(40.3)	0.151	48(46.2)	13(35.1)	0.245
	Female	71(57.7)	12(57.1)		62(56.9)	21(60.0)		69(57.0)	13(56.5)		65(56.5)	16(61.5)		8(42.1)	71(59.7)		56(53.8)	24(64.9)	
Patient Age (years)		75.2 ± 6.8	72.6 ± 4.2	0.023	75.1 ± 7.0	74.0 ± 5.1	0.423	75.2 ± 6.9	73.5 ± 5.3	0.272	75.2 ± 7.0	73.4 ± 4.6	0.118	74.6 ± 5.5	74.9 ± 6.8	0.841	75.4 ± 6.9	73.0 ± 5.3	0.055
Family structure	Lives alone	27(22.0)	5(23.8)	0.522	24(22.0)	8(22.9)	0.917	28(23.1)	4(17.4)	0.382	25(21.7)	6(23.1)	0.882	15(78.9)	93(78.2)	0.603	23(22.1)	8(21.6)	0.950
	Other	96(78.0)	16(76.2)		85(78.0)	27(77.1)		93(76.9)	19(82.6)		90(78.3)	20(76.9)		4(21.1)	26(21.8)		81(77.9)	29(78.4)	
Number of household members (persons)		2.2 ± 1.1	2.1 ± 0.9	0.521	2.2 ± 1.1	2.0 ± 0.8	0.162	2.2 ± 1.1	2.0 ± 0.8	0.964	2.2 ± 1.1	2.1 ± 0.9	0.475	2.2 ± 0.9	2.2 ± 1.1	0.804	2.2 ± 1.0	2.3 ± 1.1	0.112
Household income	< 2,000,000 yen	28(23.7)	8(40.0)	0.125	24(22.9)	12(36.4)	0.123	29(25.0)	7(31.8)	0.504	27(24.3)	9(37.5)	0.186	5(26.3)	28(24.8)	0.534	27(26.7)	7(20.6)	0.475
	≧ 2,000,000 yen	90(76.3)	12(60.0)		81(77.1)	21(63.6)		87(75.0)	15(68.2)		84(75.7)	15(62.5)		14(73.7)	85(75.2)		74(73.3)	27(79.4)	
DASC-8	Category I	100(82.0)	18(85.7)	0.477	89(82.4)	29(82.9)	0.951	99(82.5)	19(82.6)	0.628	93(81.6)	23(88.5)	0.301	16(84.2)	96(81.4)	0.529	83(79.8)	32(88.9)	0.165
	Category II, III	22(18.0)	3(14.3)		19(17.6)	6(17.1)		21(17.5)	4(17.4)		21(18.4)	3(11.5)		3(15.8)	22(18.6)		21(20.2)	4(11.1)	
Visits to the dental clinic	Irregular	33(26.8)	11(52.4)	0.019	29(26.6)	15(42.9)	0.069	31(25.6)	13(56.5)	0.003	32(27.8)	11(42.3)	0.301	6(31.6)	37(31.1)	0.579	29(27.9)	13(35.1)	0.408
	Regular and both	90(73.2)	10(47.6)		80(73.4)	20(57.1)		90(74.4)	10(43.5)		83(72.2)	15(57.7)		13(68.4)	82(68.9)		75(72.1)	24(64.9)	
Number of years attending dental clinic (years)		11.5 ± 10.6	10.4 ± 12.7	0.673	11.1 ± 9.7	12.3 ± 14.2	0.640	11.3 ± 10.0	12.7 ± 14.8	0.673	11.7 ± 10.8	10.2 ± 11.7	0.565	11.4 ± 12.0	11.2 ± 10.7	0.930	12.1 ± 10.4	8.3 ± 10.1	0.061
Reasons for choosing current dental clinic (% of yes)	Good reputation for treatment techniques	44(35.8)	2(9.5)	0.012	42(38.5)	4(11.4)	0.002	43(35.5)	2(8.7)	0.007	43(37.4)	2(7.7)	0.002	6(31.6)	38(31.9)	0.975	39(37.5)	6(16.2)	0.017
	Good attitude of dentist and staff	54(43.9)	4(19.0)	0.025	48(44.0)	10(28.6)	0.105	52(43.0)	6(26.1)	0.130	50(43.5)	6(23.1)	0.055	6(31.6)	49(41.2)	0.428	46(44.2)	10(27.0)	0.066
	Close to home or place of work	51(41.5)	15(71.4)	0.011	48(44.0)	18(51.4)	0.445	51(42.1)	16(69.6)	0.016	49(42.6)	15(57.7)	0.163	10(52.6)	53(44.5)	0.511	45(43.3)	19(51.4)	0.396

Table 6 Relationship between visits to the dental clinic and dentist and patient factors

	Model 1			Model 2		
	Odds ratio	95% CI	*P*-value	Odds ratio	95% CI	*P*-value
Explanatory variable						
Dentist sex (Ref: male)	1.769	0.487–6.429	0.386	1.337	0.369–4.841	0.658
Dentist age	0.981	0.927–1.038	0.507	0.987	0.930–1.047	0.659
Household income (Ref: < 2,000,000 yen)	3.971	1.649–9.563	0.002	2.864	1.197–6.849	0.018
DASC-8 (Ref: Category II, III)	2.292	0.854–6.147	0.100	3.145	1.289–7.678	0.053
Total score for patient evaluations of dentist explanations	1.219	1.020–1.360	0.009	-	-	-
Total score for patient evaluations of dentist communication	-	-	-	1.149	0.912–1.447	0.238

Purpose variable: Visits to the dental clinic (0: Irregular 1: Regular)

explanations, particularly in the domain of "comparison with other treatment methods," to cater to the informational needs of older patients in clinical dental practice. Furthermore, a significantly higher percentage of female dentists explained these items well, while a significantly higher percentage of male dentists did not. In recent years, it has been reported that treatment by female physicians is associated with lower mortality rates than that of male physicians [17]. The authors suggest that female patients may feel comfortable consulting female physicians, although the mechanism for this is unknown. The results of this study also suggest that gender differences may influence dentists' explanations. However, with only two female dentists included in this study, drawing any conclusions is difficult. The proportion of female dentists in Japan is increasing. Currently, about half of all dentists in their 20s are women. In this study, age may have influenced sex differences, and further research on the influence of age and sex differences among dentists is needed.

In addition, younger age and having more than one dentist were significantly associated with adequate explanation in all eight items of explanation. The background for the significant association with age may be the enhanced communication education in dental education in recent years and the increased awareness of patients' rights. In addition, our study also reported that having more than one dentist was associated with fewer violations of the duty to explain [7], so having more than one is an important factor. Although many dental clinics in our country have a singular number of dentists, the number of working dentists is increasing), and further improvement is expected in the future.

Previous studies on patient-dentist communication and dentist explanations are limited, but a few studies have used patient satisfaction as an outcome. An analysis of nationally representative dental data for all generations in Taiwan revealed a minimal association between patient satisfaction and patient age. Instead, the study emphasized that better communication, exemplified by easily understood dentist explanations, increased patient satisfaction [18]. In addition, a study conducted in a Hungarian dental clinic reported that easy-to-understand treatment explanations are associated with patient satisfaction [19]. A systematic review of effective interventions for regular dental visits in the United Kingdom indicated that communication, patient-dentist collaboration, and communicating the benefits of regular dental visits are the key points of "effective intervention" [20]. Based on these previous studies, we conducted a multivariate analysis in the present study, focusing on patient outcome as regular visits, dentist explanation, and communication factors. The results showed that dentist explanation was significantly associated even after adjusting for patient factors that were considered barriers. Dentist explanation was found to influence patients' preventive visits.

Communication factors

On the other hand, for the communication factor, multivariate analysis showed no significant association with patients' regular visits to the dentist. This study utilized the communication between elderly patients and dentists as an outcome. Drawing from insights gained from previously conducted communication surveys, the following items were included in the study: "My dentist is friendly," "My dentist tries to listen to me," and "Treatment time." Stein et al. [19] conducted a literature review on the barriers to dental visits among elderly patients. They reported the need for warm nonverbal communication, the use of plain language, and open-ended questions as essential items for effective communication with elderly patients. Thus, the content and manner of explanation emerge as pivotal factors in patient-dentist communication. The results of the present study supported these findings in a univariate analysis. Furthermore, they emphasized the essential role of listening in effective communication with older patients [19]. Another study involving all age groups highlighted that the positive attitudes of dentists who actively listened were associated with patient loyalty [4]. Thus, effective communication, such as "listening well," is expected to promote regular dental visits by eliminating barriers to dental visits among older patients.

A link between consultation time and patient satisfaction has also been noted in other studies [17].

Furthermore, an association between waiting time and patient satisfaction has been reported [21], and consultation time and waiting time are considered factors that influence patient satisfaction. In the present study, an association was found between the perception that "treatment time was too short" and inadequate patient explanations, suggesting that sufficient time for explanations is important for effective communication.

Other factors that discourage regular dental clinic visits

Several factors have been identified as barriers to regular dental visits among older adults. Murakami et al. [22] found an association between low income and low preventive dental visits among adults in our country, and Aida et al. reported similar results among older adults [23]. The results also show that economic factors are significant disincentives to regular dental visits. Financial problems and medical visits, especially among older adults, are pressing issues that need to be addressed to improve regular dental visits and patient satisfaction, including support for public insurance. Furthermore, some patients who chose a dental clinic because of its proximity had lower dentist explanation and communication scores than others. This discrepancy may stem from individuals opting for the nearest dental clinic despite dissatisfaction due to reduced physical mobility, lack of transport, and an inability to drive a car. Addressing these accessibility issues becomes crucial in overcoming barriers to regular visits, necessitating the implementation of effective measures.

Significance of this study and future developments

The majority of previous studies have relied on questionnaires about general perceptions and experiences, with only a few assessing the real-world clinical situations. Therefore, this study analyzed communication within the clinical dental practice. Japan, being a super-aged society, has a higher proportion of elderly people, emphasizing the significance of effective communication with this demographic and motivating the conduct of this study. In recent years, an increasing number of studies have focused on assessing trust and distrust of doctors and dentists. Tiwari et al. used the Dental Trust Scale (DTS) to assess trust in patient-dentist relationships. The DTS was used to examine trust in patient-dentist relationships [24]. They reported that trust was not associated with age, gender, and race, but was associated with being a family doctor, communicating, and understanding the patient's lifestyle. Fico [25] et al. examined patients' perspectives on oral healthcare provider communication using an online survey. The results showed that trust in healthcare providers was an important factor in positive and negative communication. Further research is required on the evaluation, analysis, and improvement of trust in doctors in Japan. More recently, data analysis, such as the analysis of patient experience, has been undertaken. Lin et al. [20] analyzed more than 200,000 patient reviews. Fico et al. [24] examined patients' perspectives on oral healthcare provider communication using an online survey. Therefore, new health communication methods have been developed. Our study contributes to the body of knowledge on dental communication in Turkey.

Limitations of this study

This study has several limitations. First, the selection of target dental clinics introduces a bias, as it was limited to dental clinics and other clinics that were considered feasible for implementation. Furthermore, there may have been bias on the part of the dentist because he or she was informed in advance that an evaluation would take place. Second, the study's focus on older people as the target population precludes comparisons with middle-aged and younger individuals. Consequently, age-related discussions based on the results are not feasible due to the constraints of the clinical setting and the inability to increase the participant pool. Future research endeavors should aim to conduct surveys encompassing a broader age range to address this limitation.

Third, Japan has a different healthcare system than many other countries. In dentistry, prosthetic treatment is covered by insurance, and patients pay less for treatment. This may have a significant impact on dentists' explanations and patients' choices. Insurance coverage offers few alternative treatment options, and the dentist's scope of explanation may be smaller. Also, It is also assumed that the patient was affected in some way, but the details are not clear, as this was the next period of the corona epidemic and visits to the dental clinic were restricted.

Conclusion

Adequate explanations by dentists to elderly patients were significantly associated with communication. Improving the quantity and quality of explanations provided by dentists regarding treatment may lead to effective communication with older people, which in turn may improve patient satisfaction and promote regular dental visits.

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Author contributions

TH gathered the data, performed statistical analysis, and drafted the manuscript. AH provided the scientific direction for the study, designed the work, and assisted with editing. All authors have read and approved of the final version of the manuscript.

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Data availability
The datasets used and analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study was approved by the Kyushu Women's University Ethical Board (approval number H30-31). Informed consent was obtained from all patients.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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