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Patients' knowledge and perceptions of interproximal reduction as part of orthodontic treatment in a publicly-funded orthodontic service in the Republic of Ireland

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Introduction

Extractions for orthodontic reasons are on the decline and interproximal reduction (IPR) has become a popular alternative. No survey has been undertaken to identify patients' perceptions regarding IPR.

Objectives

To determine patients' knowledge and perceptions of having IPR as part of orthodontic treatment.

Method

A questionnaire was administered to patients receiving orthodontic treatment with IPR in a publicly funded orthodontic service. Information was collected on demographics, knowledge and perceptions of IPR.

Results

Thirty patients completed the questionnaire. Only 17% were aware of IPR before treatment, but all clearly understood its rationale after explanation. Most (93%) "did not mind" IPR being undertaken, 37% considered it "uncomfortable" and 13% "painful". All perceived IPR as preferable to extraction. Compared to extraction, IPR was most commonly perceived as less painful, faster, and allowing retention of natural teeth. When asked what patients would tell a friend or family member about IPR, a small number would mention advantages over extraction, speed of the procedure and benefits for treatment. Most would provide reassurance as to the lack of pain and discomfort.

Conclusions

Although initially unfamiliar with IPR, patients found it easy to understand on explanation and considered it uncomfortable rather than painful. Minimal negative feedback was received and IPR was perceived as preferable to extraction.

INTRODUCTION

Recent orthodontic surveys have reported a decline in the extraction of teeth for relief of crowding.^{1,2} There has been an accompanying trend in using interproximal reduction (IPR) to create space by reducing the mesiodistal dimensions of teeth.^{1,3,4} IPR may also address tooth size discrepancies (TSDs), reduce black triangles and enhance post-treatment stability.⁴⁻⁸ Compared to premolar extraction, IPR has been found to shorten treatment time, facilitate stable space closure, minimise profile change and bone loss, and to be associated with better gingival adaptation.⁹ IPR can be used in conjunction with fixed or removable appliances, including clear aligners.¹⁰ As large numbers of

patients are being treated with these appliances in both general and specialist practice, IPR use is becoming widespread.¹¹

The use and perception of IPR from the clinician's viewpoint have been explored.^{1,2,11-14} Clinicians surveyed in North America and India used IPR most frequently to address TSDs, relieve crowding in borderline extraction cases, and to reduce relapse.^{13,14} Handheld strips were mostly employed, and postoperative fluoride treatments were infrequently prescribed.^{13,14} Recent surveys in European countries reported growing reliance on IPR for relief of crowding and reluctance to extract teeth for orthodontic reasons.^{1,2} There was no consensus among clinicians with respect to the risk of caries development, tooth sensitivity and residual spacing following IPR.¹¹⁻¹⁴ With the exception

of one study, which reported on pain, none have focused on patient perceptions of IPR.¹⁵

With the use of IPR and orthodontics increasing in practice, along with a greater emphasis on patient-reported outcomes,¹⁶ the aim of this study was to determine patients' knowledge and perceptions of IPR as part of orthodontic treatment. Awareness of what patients know and perceive about IPR could assist the practitioner in discussion when IPR is considered as part of treatment.

MATERIALS AND METHODS

Ethical approval was granted by the Clinical Research Ethics Committee of the Cork Teaching Hospitals. A *de novo* questionnaire for in-person completion was developed. The questionnaire was formulated and pre-piloted according to recommended guidelines.^{17,18} Then a random sample of five prospective consecutive patients undergoing IPR was used to pilot the questionnaire. These responses were not included in the final dataset. Minor changes to the questionnaire instructions were made following piloting to address an issue of questions requiring one answer per row getting an answer only on the first row.

A convenience sample of 30 consecutive patients who were to receive IPR as part of their orthodontic treatment within a publicly funded orthodontic service were invited to complete the questionnaire by their treating clinician between January and November 2020. Convenience sampling was used due to its helpfulness in obtaining a range of opinions and in identifying tentative hypotheses that can be tested more rigorously in further research, as well as the lack of baseline data on the subject matter with which to calculate a sample size for probability sampling. Patients were invited to participate regardless of the number of teeth, area of the mouth or amount of reduction planned. Informed consent/assent was given by each patient/parent using a standardised written consent form. IPR was performed using a handheld strip (**Figure 1**). Patients completed the questionnaire on their own in a quiet area of the clinic at the end of the first or only visit where IPR was performed.

Results were analysed descriptively. Inductive thematic analysis of responses to free-text questions followed recommended guidelines^{17,19}; after familiarisation with the data, it was coded and themes were generated. These themes were then reviewed with reference to the original data, defined and named. This analysis was done independently and in duplicate by two of the authors, with any disagreements resolved by consensus.

RESULTS

DEMOGRAPHIC DETAILS

All 30 patients responded to the questionnaire (13 males and 17 females with a mean age of 16.2 years (SD 1.75 years, range 13–20 years)).



Figure 1. Method of IPR used.

KNOWLEDGE OF IPR

Only 17% of patients were familiar with IPR before treatment, mostly through friends or family, but all clearly understood its rationale after explanation.

The benefits that patients recalled regarding the justification for IPR in their own treatment included relief of crowding (77%), improvement in tooth shape and size (30%) and avoidance of extraction (20%). Post IPR, 53% reported being advised of tooth sensitivity, and the use of fluoride mouthwash (63%) and interdental brushes (37%).

PERCEPTIONS OF IPR

No patients felt that their teeth would be made weaker, but 7% thought that their teeth might be made more prone to decay because of IPR. Just 10% reported being worried about IPR before the procedure was performed.

When asked if they perceived IPR as “uncomfortable”, 37% of patients agreed, 33% were neutral and 30% disagreed. Few patients (13%) agreed that IPR was “painful”, with 23% being neutral and 63% disagreeing. On a visual analogue scale (VAS), mean pain score reported was rated 2.3/10 (range 0–6) (**Figure 2**). Post-IPR sensitivity was reported by only three patients (10%) and 93% “did not mind” having the procedure.

IPR was deemed preferable to extraction by all, with six themes identified (**Table 1**). IPR was most commonly perceived as less painful, faster and allowing retention of natural teeth. Less common responses were that IPR was perceived to be less invasive, did not require local anaesthesia and reduced overall treatment time. When asked what patients would tell a friend or family member about IPR, nine themes emerged (**Table 2**). Most would provide reassurance as to the lack of pain and discomfort, although a small number would mention advantages over extraction, speed of the procedure, benefits for treatment, bleeding or side effects.

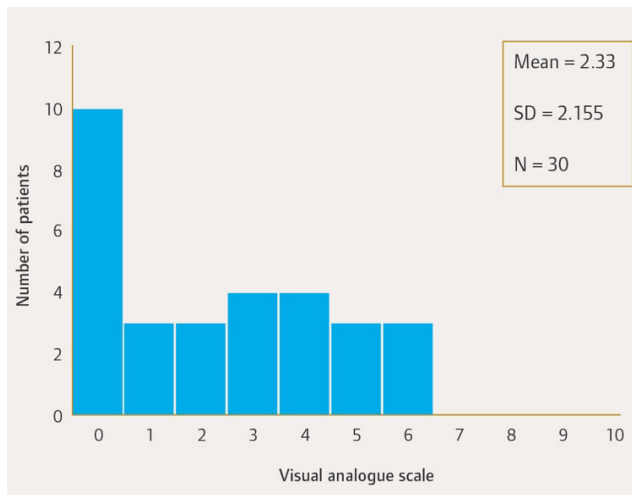


Figure 2. Results of visual analogue scale, which measured pain.

DISCUSSION

This survey determined patients' knowledge and perceptions of IPR as part of orthodontic treatment, which do not appear to have been reported previously. A questionnaire survey design was chosen for several reasons: a lack of existing baseline data; ease of administration; to gain insight from a larger number of patients than structured interviews; and, to generate hypotheses for future research. While surveys of IPR have been conducted in specialist practice, none had been undertaken within a publicly funded orthodontic service. All respondents completed every closed-ended question, and all but one respondent

completed the open-ended section of the questionnaire, which is considerably greater than the reported 35% average completion rate for open-ended questions in surveys.²⁰

Prior knowledge of IPR was only recorded by 17% of patients. Minimal data exists regarding patients' prior knowledge of orthodontic adjunctive procedures, with only 3% of a Saudi Arabian sample acknowledging prior awareness of corticotomy.²¹ Despite patients indicating a lack of familiarity with IPR at the outset, none had difficulty with comprehension after explanation during the informed consent process.

Patients surveyed in the present study expressed unanimous preference for having IPR rather than extraction. Similar themes of minimal pain and discomfort emerged in the answers to the open-ended questions regarding why patients would prefer IPR compared to extractions, and what they would tell others about the procedure. Of note, pain and discomfort have also been highlighted as important themes by patients in regard to orthodontic appliances and overall treatment satisfaction.^{22,23}

IPR was regarded as "uncomfortable" rather than "painful", with a VAS rating of 2.3/10, which mirrors that reported formerly in a German population (2.22-2.34/10).¹⁵ Interestingly, the level of discomfort regarding extraction in North American and African surveys was 23/100 and 2.9-3.4/10, respectively.^{24,25} While IPR has never been directly compared to extraction, it would appear from the findings of these surveys that the difference in discomfort between IPR and extraction may not be as profound as patients perceive. This, however, requires further investigation.

Patient reluctance to have teeth extracted is an increasing trend,¹ and the minimally invasive approach that IPR affords permits patients to retain their natural teeth. Side

Theme	Number of similar responses	Example quote
Less painful	17	"It doesn't hurt as much as getting teeth out"
Faster procedure	7	"I feel trimming is better because it takes less time"
Retain natural teeth	6	"Wouldn't like to lose any teeth"
Less invasive	4	"Because it's not that big of a procedure than getting teeth pulled"
No anaesthetic required	3	"No numbing needed"
Reduce overall treatment time	1	"Because it means that I won't have to have my braces on longer for the gap to fill in"

Table 1. Patient-perceived advantages of IPR versus extraction (n=29).

Theme	Number of similar responses	Example quotes
Pain	21	"I would recommend it because it wasn't painful" "I would say they will feel a slight bit of pain and sensitivity at first but you will be ok after a couple of seconds"
Discomfort	13	"It might be uncomfortable, but it's not painful and will be over soon" "The very first tooth is uncomfortable but after that they're grand"
Compare to extraction	7	"That it doesn't hurt and doesn't take long at all compared to getting a tooth extracted"
Speed	6	"It's a fast process"
Beneficial for treatment	5	"It will help your teeth to look better"
Not to worry	3	"Having your teeth trimmed is nothing to worry about"
Bleeding	3	"Sometimes your gums could bleed a small bit but overall it's fine"
Side effects	3	"I would ... inform them of the side effects my dentist told me about"
Recommendation	3	"I would recommend that they do it as it will help your teeth come together"

Table 2. Information that patients who had IPR would impart to others (n=29).

effects such as gingival bleeding and tooth sensitivity were mentioned infrequently, but as these have been found to have no long-term periodontal or dental consequences,¹⁵ patients should be reassured in these regards.

The positives of the study presented here are the focus on patient perspective and high completion rate of all questions, including those that were open ended. It provides baseline data from a single centre and although this may confine the generalisability of the findings, these can be compared to other patient groups and settings. A limitation of this study is that the questionnaire was administered by the clinician treating the patient, which could have motivated patients to be more positive about their experience. In addition, the timing of the questionnaire immediately following the visit at which IPR was performed may not have given adequate time for patients to experience potential side effects such as postoperative sensitivity. All patients in the present study experienced IPR with a handheld

strip and future research could compare patient perceptions of IPR with other techniques. Other qualitative methods such as focus groups could be used to attempt to gain deeper insights into patient perceptions about IPR and may help to identify how best to describe the procedure to patients and obtain consent.

CONCLUSIONS

Although initially unfamiliar with IPR, patients found it easy to understand on explanation and considered it uncomfortable rather than painful. Minimal negative feedback was received and IPR was perceived as preferable to extraction.

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