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Title: Attitudes towards oral health in patients with rheumatoid arthritis. A qualitative study nested within a randomized controlled trial

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Knowledge transfer statement: This article provided insights into the experiences and perceptions of rheumatoid arthritis patients about their oral health to improve patient participation in a definitive clinical trial.

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Figures/tables legend

Table 1: Demographics of the patient population (qualitative interviews)

Figure 1: Study flow diagram

Legend Fig. 1 QEHB = Queen Elizabeth Hospital Birmingham; SWBH = Sandwell and West Birmingham Hospitals; HEFT = Heart of England NHS Foundation Trust

Figure 2: Emerging themes from the interviews

Abstract

INTRODUCTION: Patients with rheumatoid arthritis (RA) present higher incidence and severity of periodontitis than the general population. Our study, Outcomes of Periodontal Treatment in Patients with Rheumatoid Arthritis (OPERA) was a randomized waiting-list-controlled trial using mixed methods. Patients randomized to the intervention arm received intensive periodontal treatment and those in the control arm received the same treatment with a six months delay.

AIM: The nested qualitative component aimed to explore patient's experiences and priorities concerning oral health and barriers and facilitators for trial participation.

METHODS: Using purposive sampling until thematic saturation was reached, we conducted 21 one-to-one semi-structured interviews with randomized patients in either of the two treatment arms as well as with patients who did not consent for trial participation.

RESULTS: The patients described their experiences about RA, oral health and study participation. Previous experiences with dental care professionals shaped patients' current perceptions about oral health and the place of oral health on their list of priorities when compared with other conditions. Patients also highlighted some of the barriers and facilitators for study participation and for compliance with oral health maintenance. The patients, in the control arm, presented their views regarding the acceptable length of waiting time for the intervention. CONCLUSION: The associations between periodontal and systemic health are increasingly recognised

by the literature. Our study provided an insight into RA patients' experiences and perceptions about oral health. It also highlighted some of the barriers and facilitators for participating in a periodontal interventional study for this group. We hope that our findings will support the design of larger interventional periodontal studies in patients with rheumatoid arthritis. The complex challenges faced by the burden of RA and the associated multimorbidities in this patient group might highlight opportunities to improve access to oral health services in this patient population.

INTRODUCTION

Chronic periodontitis is a very common chronic inflammatory condition. It affects nearly half of the UK adult population and over 60% of the elderly (Chapple 2014; White et al. 2012). Several observational studies have reported an association between chronic periodontitis and rheumatoid arthritis (RA) and chronic periodontitis has been suggested as a potential risk factor for RA (de Pablo et al. 2009; Konig et al. 2016; Mikuls et al. 2009; Okada et al. 2013; Ribeiro et al. 2005). Given the high prevalence of chronic periodontitis, this association could have significant clinical and public health implications.

The first symptoms of RA are noticed usually between the age of 35 and 50 and it affects mostly women. Within 5 years of diagnosis, 40% of patients reduce their working week from full time to part time, with an increase to 50% at 10 years from the first diagnosis (Mathers and Pfleger 2006). Rheumatoid arthritis affects patients' personal and professional relationships transforming their daily routines and quality of life. Often they have to change their working circumstances or retire early, adapt their living conditions, rely on help from external sources (family, friends or social workers) and increase their feeling of vulnerability which is added as a psychological burden to their condition (Lapsley 2002).

Besides the direct impact of RA on patients' quality of life, it is important to consider also the indirect impact caused by the comorbidities secondary to RA and the side effects of the long-term use of polypharmacy in this patient group.

RA has been frequently associated with other conditions including depression, elevated blood pressure, cardiovascular disease and respiratory conditions. (Dougados et al. 2014).

There are several potential mechanisms linking RA and periodontal disease. Some studies have suggested that bacteraemia caused by periodontal pathogens could be an etiological agent for RA progression (Martinez-Martinez et al. 2009).

Another widely supported model relates to an aberrant immune response to periodontal pathogens in certain susceptible individuals. One of the main periodontal pathogens is Porphyromonas gingivalis. With the recent recognition of the importance of anti-citrullinated protein antibodies (ACPA) in RA and the discovery that P. gingivalis expresses peptidyl arginine deiminase which is responsible for the post-translational citrullination of peptide antigens on arginine residues (Rosenstein et al. 2004), there is potential evidence to support a plausible pathobiologic mechanism by which periodontitis may cause or sustain the ACPA response in RA.

Recent studies have also demonstrated that the uncitrullinated peptides play a major role in the antibody response for periodontitis resulting in a systemic spread of citrullinated epitopes in the presymptomatic phase of RA. Autoantigens modified by citrullination through exposure to periodontal pathogens might sustain synovial inflammation in the context of untreated periodontitis (Lopez-Oliva et al. 2018; Rosenstein et al. 2004). Antibodies for uncitrullinated RA autoantigens precede the ACPA formation and facilitate the loss of tolerance to uncitrullinated peptides (de Pablo et al. 2013).

Treatment of chronic periodontitis involves control of the dental biofilm, typically using non-pharmacological means. Whether or not such treatment can reduce the incidence and severity of RA is unknown. However, a small number of interventional studies have reported encouraging results in terms of reduced RA disease activity following periodontal treatment (Al-Katma et al. 2007; Okada et al. 2011; Ortiz et al. 2009).

Our trial, Outcomes of Periodontal Treatment in Patients with Rheumatoid Arthritis – OPERA, was a randomized waiting list controlled feasibility study. This trial provides feasibility data for a larger, multi-centre randomized controlled trial, which would investigate the efficacy of non-surgical periodontal treatment in reducing disease activity in patients with RA.

Our trial focussed on issues of recruitment and retention, acceptability and feasibility of the trial procedures including the intervention, assessments and data collection, using a mixed methods approach. The quantitative component of our trial gathered pilot clinical data about the efficacy of periodontal treatment in patients with RA and subsequently its influence on health-related quality of life.

Considering the severe burden that RA can have on the patient's quality of life, both directly and through the comorbidities associated with this condition, it is important to gain a better understanding of patients' priorities with regards to accessing different types of health care services. Additionally, it is important to ensure that the design of any interventional studies would take this into account and patients' trial participation would not create an additional burden on their quality of life. As successful periodontal treatment is heavily dependent on compliance and

adherence and the treatment and trial participation both require multiple visits to the secondary care setting where this treatment was being delivered we considered important to explore the barriers and facilitators for study participation in this patient group.

Furthermore, in order to encourage recruitment and retention rates in the trial, it is important to consider that outcomes that are relevant for clinicians and researchers might be less relevant for the patients. This could be especially the case for RA patients with multimorbidities as suggested in the literature (Cohen et al. 2004; Fleischmann et al. 2016). Understanding the health care priorities of this specific patient population and the place of oral health on their list of priorities was one of the most important objectives of the qualitative component of our study.

Our study used a mixed method approach with a quantitative and a nested qualitative component. The quantitative aspects of the trial will be presented in detail in a separate paper. This paper focuses on the nested qualitative component of this study.

Aims and objectives

The aim of the qualitative component of our study was to evaluate patients' experiences, values and priorities that shape their choices in accessing oral health services and identify the barriers and facilitators for participation in a randomized controlled trial. In order to meet this aim, we developed the following objectives: 1. Understand the impact of RA on the patient's quality of life and the place that oral health occupies on their scale of health priorities; 2. Identify barriers and facilitators

for study participation; 3. Understand RA patients' views about randomisation to the intervention or control group (delayed intervention).

METHODS

The OPERA trial recruited patients with RA, fulfilling the revised 1987 ACR classification criteria for RA (Aletaha et al. 2010). The recruitment sites were the outpatient rheumatology clinics of the Queen Elizabeth Hospital (QE), City Hospital and Heartlands Hospital all in Birmingham, U.K.

A total of 691 RA patients were identified as potential participants from the three recruitment sites. Of these, 118 declined participation in the trial predominantly due to the severity of their comorbidities and the numerous medical appointments that they already have to attend.

Of these, 296 patients consented to participate in the trial and 201 attended the periodontal screening visit at Birmingham Dental Hospital. Of these, 60 met both the RA and periodontal criteria for randomization and were allocated to either immediate intervention or waiting list control (delayed intervention) group (Figure 1). The intervention consisted of non-surgical periodontal therapy delivered by a dental hygienist in two or more sessions in a secondary care setting.

PLEASE INSERT FIGURE 1

Study oversight

Ethical approval for the OPERA trial was granted (11/WM/0235, protocol number RG_10-138 and registered via the Integrated Research Application System (IRAS) with project ID 53163.

Recruitment

The recruitment for the trial started in January 2014 and data collection ended in December 2016. Research and development (R&D) approval was obtained for all the participating sites.

Some of the inclusion criteria for the periodontal screening were, among others, fulfilment of 2010 ACR/ EULAR classification criteria of RA (Aletaha et al. 2010) and stable medication. For randomization, patients had to have a disease activity score (DAS28) of at least 3.2 and generalized moderate to severe chronic periodontitis as evidenced by pocketing with clinical attachment loss (clinical attachment loss ≥ 4 mm on at least 2 non-adjacent teeth and cumulative probing depth ≥40mm).

For exclusion criteria, we considered history of, or current, inflammatory joint disease other than RA (including, but not limited to, gout, reactive arthritis, psoriatic arthritis, seronegative spondyloarthropathy); any surgical procedure including bone/joint surgery/synovectomy (including joint fusion or replacement) within 12 weeks prior to baseline or planned during study and periodontal treatment within 12 months prior to baseline.

A detailed description of the clinical methodology and findings will be reported in a separate paper.

Screening

Patients were approached for consent during their rheumatology follow-up appointments at the participating hospitals. After consenting, clinical rheumatologic data were collected and a screening appointment was offered at the OPERA

research clinic at Birmingham Dental Hospital. As some patients expressed an unwillingness to participate because of the logistic difficulties in getting to the Dental Hospital, further assistance was offered with transportation to these patients. Reminder letters with the appointment date and time for the Screening visit were sent out by post to each newly booked patient. One or two days before the appointment, a research nurse called the patients to remind them of their appointment.

At Birmingham Dental Hospital, patients were assessed in a dedicated clinic available for OPERA trial patients. This involved general clinical examination, rheumatologic assessment including the disease activity score 28 (DAS28), full mouth probing, and biological sample collection.

Randomization and follow-up

If patients fulfilled the eligibility criteria for randomization and treatment, they were offered participation in the interventional phase of the study. After consenting for randomization and treatment, patients were randomly allocated to either immediate treatment or delayed treatment (waiting list control). For the patients allocated to the immediate treatment arm, three appointments were booked with a dental hygienist allocated for this project at maximum of three weeks after the Screening visit. Patients in the delayed treatment arm had one appointment with the same hygienist for instructions on oral health maintenance.

The same clinical examinations were carried out at the follow-up visits as at baseline. The patients allocated to the delayed treatment group were offered three

appointments with the same dental hygienist for periodontal treatment at the end of the study. All the patients, at the end of the study received £150 to cover the possible costs regarding their commitments for study participation. Most patients who did not wish to consent for screening were offered the possibility to participate in the qualitative interview process, either face to face or over the telephone. Inviting patients who did not consent to take part in the clinical trial to participate in the qualitative interviews was particularly important to meet our aims and objectives in identifying barriers and facilitators for study participation.

Sample Selection

For the purposes of the qualitative component of this study, we used a purposeful sampling technique aimed to include a variety of patients and to ensure broad representation of views relevant to the various aspects of study participation. We therefore invited patients who:

- Had declined to consent for the clinical intervention
- Were screened but were not eligible for randomization for the clinical intervention
- Were randomized to the immediate periodontal treatment group
- Were randomized to the control group
- Were representing gender diversity
- Presented different lengths of time since diagnosis (RA)

One to one, semi-structured interviews were conducted with patients from all these groups until thematic saturation was reached. As new themes emerged from the

discussions, the topic guide was constantly adapted and new themes were added until saturation was reached. Saturation was defined as the stage at which no new themes emerged from the interviews and the data started to become mainly repetitive. After saturation, three more interviews were conducted for quality assurance purposes. All interviews were carried out by the same researcher to ensure consistency. All interviews were recorded and fully transcribed. The first five interviews were conducted by a dentist under the supervision of an expert in qualitative research (psychologist). The interviews were conducted at Birmingham Dental Hospital, Queen Elizabeth Hospital Birmingham and over the telephone between October 2014 and January 2016 and lasted on average 30 minutes. Sixteen interviews were conducted face to face and five over the telephone. Some participants preferred to have the interview conducted over the telephone for convenience, especially those who did not wish to consent for trial participation. In relation to the other aspects of the study, the first patient was screened in February 2014 and the last patient was randomized in October 2015.

Topic guide

The initial topic guide developed by the research team included: oral health maintenance, treatment preferences (dental and medical), access to dental care, priorities and values placed on oral health, quality of life issues, acceptability of the periodontal treatment and, if applicable, reasons for non-participation. This initial topic guide was piloted with three patients who consented to participate. The piloting phase was developed and implemented by the research team to ensure

methodological accuracy of the interview process. The results of these three interviews were included in the overall findings. Based on the dynamics of the discussions and the flexible structure of the interviews, new themes emerged that were incorporated in the topic guide and added to the interviews with subsequent participants.

Data analysis and validation

A framework approach to data analysis was adopted in the manner suggested by Pope et al. (Pope and Mays 2006). The framework was developed using the topic guide and additional columns were added to the framework as new themes emerged from the interviews. One researcher (dentist) carried out the interviews and the analysis in order to assure consistency and robustness. The transcripts were read and analysed independently by a second researcher (psychologist) following NICE guidelines (Tan et al. 2009). The two researchers discussed and reached consensus of the findings. A third independent researcher was available to oversee the findings in case a consensus was not reached.

RESULTS

Patient demographics

21 participants (15 females, 6 males) with a median age of 60 years were interviewed to participate in the interviews (Table 1).

RA disease duration ranged from 1 year to 60 years (median 19 years). More than half of the participants (n=13) had consented for periodontal screening in the study, while the remaining participants did not (n=8) (Table 1).

Table 1 Demographic characteristics of participants in the qualitative component

Pt #	Gender	Age	Years since diagnosis	Patient group
1	F	60	19	Randomized - delayed
2	M	86	20	Refused trial participation
3	F	83	60	Refused trial participation
4	F	37	9	Refused trial participation
5	M	52	13	Randomized - delayed
6	F	59	20	Refused trial participation
7	F	68	22	Refused trial participation
8	M	65	30	Randomized - delayed
9	F	60	67	Refused trial participation
10	F	65	6	Randomized - delayed
11	F	55	12	Randomized - immediate
12	F	59	2	Refused trial participation
13	M	54	14	Refused trial participation
14	M	64	10	Not eligible for randomization
15	F	62	36	Randomized - delayed
16	F	47	15	Randomized - delayed
17	F	61	15	Randomized - delayed
18	F	62	25	Randomized - immediate
19	F	62	30	Randomized - delayed
20	M	57	20	Randomized - immediate
21	F	57	1	Randomized - immediate
Median [IQR]		60 [57,64]	19 [12,25]	

The main emerging themes from the framework analysis are presented in Figure 2. These can be clustered into three main areas: “RA and quality of life”, “Oral health” and “The Study”. The new topics that emerged from the discussions were related to patients’ perceptions of oral health and their previous experience with dental care professionals. Furthermore, the patients elaborated on their health priorities, perceived barriers for study participation and potential solutions for the removal of those barriers.

PLEASE INSERT FIGURE 2

Rheumatoid arthritis and quality of life

Discussions started with participants describing their experiences regarding the onset and subsequent history of their RA and the effect it had on their quality of life. All participants described the onset of their condition as highly distressing.

> “I remember going to pick my son up from school and walking up the high street and just with tears rolling down my face because I was in such pain… I had never known anything like it and then it just got worse from there… Everyday things that I would have done without blinking an eye just became totally impossible to do because I had no grip in my hands, no strength then to actually get myself up in the bed.” (P1)

Each story carried a vivid and painful memory associated with anxiety and distress as patients and their families struggled to understand what was happening:

> "The children thought I was going to die. I heard them talking to my wife and they said “Is dad going to die?” and I though, blimey, I must look bad, but I was so thin me bones were sticking out all over the place.” (P14)

Some of the patients shared their stories about the impact that RA had on their work and socio-economic status. In some cases, this went as far as the patients having to change their living arrangements and make compromises in order to find ways to adapt to their new situation.

> “I did retire early yes as a consequence and I had to give my home up because I couldn’t get up the stairs any more… So, within a very short space of time from 2010 to 2014 I retired early and I lost my home… I am

328 living in a bungalow now, which has been adapted for my needs. I've got
329 a wet room as opposed to a bathroom." (P10)
330 The majority of patients mentioned that they had taken early retirement or had to
331 reduce their work schedule from full-time to part-time because of the impact of RA
332 on their work life. Patients reported that this had a major negative impact on their
333 socio-economic status.
334 Besides work, RA also affected the ability of patients to enjoy their hobbies and
335 social activities.
336 "I used to enjoy football, fishing, things like that. I couldn't go fishing cos
337 I couldn't hold the rod any longer in that one position holding the rod."
338 (P20)
339 As the discussions developed around the traumatizing experiences caused by the
340 onset of RA, the patients started to describe also the challenges represented by
341 several comorbidities that they had to deal with.
342 **Comorbidities and health priorities**
343 As the average age of the participants was around sixty years, comorbidities
344 associated with RA were common. In order to gain a better insight into the reasons
345 why they might or might not participate in the study, it was important to understand
346 their health care priorities and the impact of their comorbidities and how they
347 prioritize the health care services that they are accessing. Another factor was to
348 understand where oral health was situated on their list of health care priorities.

Although, several patients declared oral health as a priority in the beginning of the interview, as the discussions evolved and they reported on comorbidities, they presented a tendency to prioritise other comorbidities compared to oral health:

> “So, I have rheumatoid arthritis and I have asthma/COPD, so I have breathing problems, but again somebody is looking after me... And that is linked to what used to be a constant round of chest infections, but they now seem to have this under control and then oral health is the third most important thing in my life. “(P9)

Patients’ numerous different hospital appointments represent a burden to some of the patients and the dental care occasionally tends to become less of a priority:

> "No, no I probably haven’t been to the dentist, it has got to be a year now, so but part of that is that I have so many appointments for different things at the moment, that unless I am reminded of an appointment, or given an appointment they tend to slip away." (P5)

As most of the patients had multiple comorbidities, some of them tended to place oral health as the last one on the scale of importance. Their main priorities were systemic conditions including RA itself, cardiovascular disease, Crohn’s disease, asthma, chronic obstructive pulmonary disease (COPD), diabetes, etc.

> “My chest really, my chest is first then my rheumatoid. My teeth, round about third I think to be honest.” (P7)

> “But the other thing to remember is for patients like me who have got rheumatoid, they’ve probably got other ongoing conditions as well. There is so many things you have to try and focus on." (P4)

In light of these, some patients reported that they would prefer to have their teeth extracted rather than have multiple appointments for conservative treatment:

"If I had to have teeth out, I have to have them out and that's the end of it." (P4)

Periodontitis and oral health

Discussions focused on patients' perceptions about oral health, their self-reported oral health status and previous experience that they had had with dental care professionals. Few participants reported having a good oral health status. Their past experiences regarding oral health care services shaped their perception regarding their current behaviour for accessing oral health services:

"Then you never used to go to the dentist, they used to come around the school, this is going back a long time nineteen fifties and sixties. … And then most of the time they just pulled your teeth out. That was, they never did any fillings or anything they just looked at your teeth and if they didn't like the look of it, they just pulled out your teeth." (P14)

Patients acknowledged the importance of good oral health and reported making efforts to try to help their children to maintain good oral health:

"I mean my kids so soon as they were old enough, like two or three, I would take them, we would take them to a dentist just to get them used to a dentist, because I think fear of dentists..." (P14)

Many patients reported that maintaining their oral hygiene was more difficult on the days with flare-ups:

394 “If I have a bad flare-up of arthritis, I can’t … and I miss it and I am not able, I
395 don’t have the strength to hold my electric toothbrush, because it is quite
396 heavy” (P9)
397 “If my shoulder hurts then it’s … it can be a bit difficult to brush.” (P13)
398 Even holding the toothbrush could be challenging for some patients:
399 “I could about hold it, I haven’t got many teeth left anyway. It’s my fear is
400 dentists.” (P2)
401 Participants mentioned the importance of developing a relationship based on trust
402 with their dental care provider. This played an important role in their attitudes towards
403 oral health and their behaviours in seeking oral health care services:
404 “Well I am concerned that my dentist hasn’t done what needed to be done to
405 save my teeth from breaking." (P13)
406 Respondents reported being afraid of needles and consequently being afraid of
407 dentists. Some patients stated that they would prefer to have extractions instead of
408 restorative treatments.
409 “I suppose out would be the best at my age I suppose out, you know.” (P2)
410 When participants were asked about the way, they felt regarding their oral health,
411 and how they regarded the visit to their dentist, many patients (particularly the more
412 elderly) reported negative attitudes. Younger patients on the other hand reported
413 that they would prefer to keep their natural teeth and have them treated.
414 As the discussions continued and patients described their comorbidities secondary
415 to RA and how oral health fitted on their list of health care priorities, they also
416 expressed their views regarding the outcomes that matter the most for them with

regards to their quality of life and wellbeing. Amongst the most important health related outcomes considered by the patients were autonomy, mobility and lack of pain.

One of them mentioned how she needed to plan her everyday activities depending on whether or not she had a flare-up:

> "You know, where before I used to think nothing of it, I would go off and do what I needed to do. Now, I can't do that, if I'm in pain I have think right I can only do one shop today, or I can't walk that far today." (P12)

Other stories were similar:

> "Health, mobility that's very important to me that my feet were not as compromised as my hands. Oh, that is very, absolutely I would tie those two together." (P3)

> "The difficulty I was facing whilst I was working was the inability to hold a pen properly …. And work and a computer. Erm, sitting down meant that my joints got really stiff, my knee joints and my back. And my feet and as a consequence mobility as I say became very bad… I couldn't get upstairs to the upstairs offices." (P10)

Personal mobility and the ability to keep their independence were key priorities for this patient population. This was also highlighted through the potential barriers that hindered study participation.

Barriers for study participation

The interviews explored the reasons why some patients would be reluctant to participate in the OPERA study to identify potential barriers that could be addressed by the research team. Several patients reported having negative experiences with dentists in the past and this discouraged them to participate in our trial –

> "Yeah, I, I think I woke up under the gas. And, I was there was blood all over the place and I was only about this high. At school. And I never went again. I stopped going for a long time" (P20)

The location of the Dental Hospital was mentioned as a hindering factor by several patients:

> "That was because it was the Dental Hospital and I find it difficult to get from my part of the town to the Dental Hospital." (P2)

> "It is a bit far away, you know the other side of town but they are moving to a new hospital shortly which will be more accessible, yes." (P18)

Due to classic features of RA such as mobility problems, fatigue and morning stiffness as well as logistic issues with the traffic from their homes to the location of the Dental Hospital, they found that without help, they could not attend their clinical appointments.

Besides the location of the Dental Hospital, patients mentioned forgetfulness and the overlap of their dental appointment with other medical appointments as being important hindering factors for study participation.

Removal of barriers

In order to address these, the participants were asked to suggest potential solutions for these problems. Some of the hindering factors were addressed by the research team, as described in the methodology section: patients received phone call reminders about their appointments and those patients that required assistance for getting to the Dental Hospital, received support in arranging the travel logistics around getting to their appointments.

> "Because as I say I wouldn't have been able to undertake the study unless I'd have had payment for transportation." (P10)

Financial incentives were set in place to compensate for the loss of time and logistics for the research and treatment visits. As all patients are unique and so is their situation and their experiences, some patients did not feel that financial incentives should encourage patients study participation:

> That always seems to help I did a lot of groups and the financial side of it isn't a big thing to me. When I did the conferences, it was all about expenses I was happy for my expenses to be paid, but a lot of the groups I also did erm, it would be like an interview, but there would be ten of us and we would sit around and the discussion would be recorded and you usually found that all those groups would be full because people were getting financial…. they were being paid for it basically, but you would find that they were all full, all of them." (P5)

Some patients reported that they suffered from dental anxiety and indicated that the only way they would participate in the study would be if the screening and treatment would be done under general anaesthesia:

> "I mean I did say to my son because he keeps telling me off he says, "Mom, you really need to go and get your teeth sorted… And I said, I will go if they can put me to sleep". If they can knock me out…. Yeah. I said that's the only way I would have it done." (P12)

The control arm

The control arm in our study received the same treatment as the intervention group but with a delay of six months. Patients had very diverse views with regards to the how long it was acceptable to delay their treatment. Some of them preferred to have no delay at all and some were happy with a delay of up to a few years.

One of the patients who declined trial participation considered that treatment should be delivered immediately without any delay:

> "I think it should be done straightaway…I don't think you should wait because with your mouth everything that goes in your stomach goes into your mouth so your gums are one of the main ones really aren't they? So, I think you know, it should be earlier than six months." (P6)

The majority of patients, however, felt that a delay of six months to their treatment would be acceptable whilst more than that might influence them to seek treatment elsewhere.

"Oh, I think it's six months… Six months would be alright…Well, perhaps 12 months is, I'm 84 don't forget." (P2)

This view was shared by the majority of patients:

"I was hoping not to be in the delayed group, but as I am in the delayed group then I leave it to you erm to help me as best you can… I wouldn't like the longer waiting time." (P15)

The intervention

All patients who received the intervention, both in the immediate treatment group as well as in the delayed treatment group reported having a positive experience concerning to the intervention.

"I'm really pleased actually that erm doing this study because erm had it not been for that, this could have gone on and on and it might have got to a really bad situation with my gums and I wouldn't have known so I am really pleased." (P11)

They highlighted the importance of being kept informed about the progression of the study and the protocol and having pleasant interactions with the research staff

Yeah, they have been good, I think the experience has been good. You staff have been really helpful and I am aware of what is happening every time I come and see you. The hygienist was great, she explained what she was going to do and what she expected to do in future, so I think it has been a really good experience as well and eye opening as well. " (P5)

This view was shared by all the patients who received the intervention:

> “She made me feel so comfortable and it’s embarrassing as well when you go to dentist... I find I get embarrassed. And because of the state of my teeth. I didn’t feel at bit like that from the moment. I met the hygienist and I felt quite confident that she was confident. She knew what she was doing. She explained everything. And she told me if anything hurt or to stop, to stop her. I just felt so comfortable with her… I would do it all over again.” (P21)

Discussion

Most studies investigating the associations between periodontitis and RA have used quantitative methodologies (Al-Katma et al. 2007; Pinho Mde et al. 2009; Ribeiro et al. 2005). OPERA was a mixed methods feasibility study with a nested qualitative component. We aimed to explore the acceptability of our study protocol and understand RA patients’ experiences and perspectives about accessing oral health care services. Furthermore, we gained some valuable insights into the place of oral health on their list of priorities, identified barriers and facilitators for study participation and gathered patients’ views about the intervention and about being randomized to the control arm.

A large amount of the data regarding the oral health status of older people in England is generated from surveys of people living in residential and nursing care homes. This represents only a minority of the elderly population and has led to a gap in our knowledge and understanding of the dental treatment preferences of this age group (Public Health England 2015). Some data suggests that for some of the older

patients aesthetics are less of a priority and comfort and lack of pain are considered more important (Lord et al. 2015).

To our knowledge, our study is the first one to look at oral health preferences in patients with rheumatoid arthritis and at barriers and facilitators for participation in a dental trial for this patient group.

Our sample was diverse and we purposefully included patients from all the possible groups involved in the study: 1. Those who declined trial participation; 2. Those who were found ineligible for randomization after screening; 3. Patients who were randomized to intervention arm and 4. Patients randomized to control arm. We also aimed to include patients of both genders and with different durations of RA diagnosis.

We have found that patients' prior experiences, values and priorities tend to have a strong impact on shaping their choices for accessing different health care services. RA patients' treatments require a holistic approach and whilst their rheumatologic care often takes into account their different systemic comorbidities, oral health is commonly missed out from this picture. Patients identified a set of barriers and facilitators that can influence their participation in an interventional study. Some of these barriers were related to patients' limited mobility and logistic difficulties associated with getting to their dental appointments.

Our patients' main concerns appeared to be represented by the ability to have as "normal" a life as possible - to live independently, autonomously and pain free. These findings are in line with the literature with regards to RA patients with multimorbidities

and how these shape their choices and priorities in terms of accessing health care services (Malm et al. 2017; Ward et al. 2007).

Our patients described their personal experiences regarding RA and the impact of this condition on their quality of life. They reported how the condition affected their physical and emotional well-being as well as the influence it had over their socio-economic status as a consequence of the reduction of work and/or early retirement based on disability.

Although many participants acknowledged the importance of good oral health and its potential impact on general health, when compared to RA and the other comorbidities that they have to live with, oral health was not a high priority.

The patients identified a number of hindering factors that might impact on their ability for study participation and some of these factors were addressed by the research team with adaptations of the study protocol.

In many cases, patients reported that they had to balance their life around the treatment they received for RA and for their comorbidities: this involved multiple medications, hospital visits, etc. The overall burden of RA and of the associated comorbidities over the quality of life of these patients could be quite overwhelming. Compliance with regular oral hygiene maintenance is key to maintaining good oral and periodontal health but it can become an extra burden for this cohort, especially on the days when they are dealing with flare-ups caused by their rheumatoid condition. Patients who struggle with high burden of debilitating systemic multimorbidities, perhaps unsurprisingly, reported that oral health was a not key priority for them.

We have also identified a number of limitations to this study. This cohort presented a median disease duration of 19 [12, 25] years. We acknowledge that the initial therapeutic options and approaches at the time of their diagnosis were quite different from those of today. Therefore, we can hypothesise that disease progression in this cohort could be significantly different compared to a cohort with a more recent onset of RA. This could potentially lead to different findings in a cohort with current early RA. When we developed the protocol for the randomized controlled trial, we aimed to include patients diagnosed with RA who were on stable treatment with disease-modifying antirheumatic drugs (DMARDs) for at least 2 months in order to reduce the likelihood of potential confounding factors caused by medication changes. It is often the case for early diagnosed RA patients to change classes of drugs and dosages, therefore after discussing this issue with rheumatologists in the research team we decided that in order to meet this goal we focus the recruitment on patients with stable established RA.

From a public health perspective, the burden of non-communicable diseases (NCDs) is becoming more and more pressing on the limited resources available for national health systems. It is perhaps time to consider new, creative ways of developing care packages that may include oral health care for patients with NCDs. This idea is supported by the American Diabetes Association as well as by the French National Authority for Health, which recommends the inclusion of a comprehensive periodontal examination as part of the referrals for initial care management in diabetic patients (American Diabetes Association 2018; Haute Autorité de Santé

2014). A similar approach may have beneficial effects for patients with other NCDs such as rheumatoid arthritis, cardiovascular disease, kidney disease, etc.

The nested qualitative component of the OPERA trial provided an insight into rheumatoid arthritis patients' experiences and perceptions with regards to oral health. Our study also highlighted some of the potential barriers and facilitators for participating in a periodontal interventional study in this patient population. We hope that these findings will support the design of larger interventional periodontal studies in patients with rheumatoid arthritis.

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