

ORIGINAL ARTICLE

Suitability of ART approach for managing caries lesions in people with disability—Experts' opinion

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Abstract

Objective. This study aimed to obtain the opinions of experts in Special Care Dentistry (SCD) regarding the suitability of the Atraumatic Restorative Treatment (ART) approach for the treatment of carious lesions in persons with disability. **Material and methods.** Thirty expert participants from around the world, joining the SCD Task Force meeting, Education Committee of the International Association of Disability and Oral Health (Antalya, Turkey, 2011), completed a questionnaire survey. Frequency distributions of variables were analysed using Chi-Square test for differences between variables. **Results.** All respondents reported having full or moderate knowledge of ART (23.3% and 63.3%, respectively) and 66.7% indicated that they felt the technique was useful for this population. However, only 50% of respondents used the technique regularly in their practice and five (16.7%) replied that they would never use it, even if a favourable evidence base for ART use in this population became available. The barriers to the introduction of ART to SCD are discussed and the need for training and further research highlighted. **Conclusions.** Barriers to the implementation of ART in practice were placement of the restoration under difficult conditions and the dentist's pre-conception of the technique as being 'lower quality dentistry'. Experts suggested that some of these barriers might be overcome by improving the evidence base in favour of the technique, specifically in the population with disability.

Key Words: atraumatic restorative treatment, attitude of health personnel, dental care for disabled, dental education, professional practice

Introduction

Poor oral health is an acknowledged problem amongst adults and children with disability. Inequalities between populations with disability and the general population have specifically been reported in terms of high levels of untreated disease in populations with behavioural problems affecting receipt of treatment, in those individuals living in institutional settings and for those patients acquiring disability later in life [1–7]. In addition, these populations have been shown to have very reduced access to preventive strategies [7–9].

The population of adults and children with disability represents an extremely diverse and heterogeneous group. One definition of the population requiring special care in dentistry is 'persons with a disability

or activity restriction that directly or indirectly affects their oral health, within the personal and environmental context of the individual' [10]. This definition is derived from the WHO International Classification of Functioning [11] and includes all types of impairment and medical disability and all age groups, but restricts the population to those with an oral health impact. Various disabilities and activity restrictions have been identified that negatively impact on access to restorative and preventive care, the most important of which is the ability to co-operate with treatment due to communication difficulties and high levels of anxiety [12–16]. When conventional treatment proves unfeasible and preventive strategies are not applied, treatment need tends to accumulate and sedation or general anaesthesia may become necessary. These

techniques are costly financially and reduce the integration of persons with disability into the mainstream healthcare system. They rarely improve access to preventive care and may limit treatment to emergency extractions rather than to planned oral rehabilitation [8,17–20].

A recently published systematic review concluded that the scientific evidence regarding the effectiveness of preventive and therapeutic strategies for managing dental caries in people with disability was very low [21]. The review concluded that the Atraumatic Restorative Treatment (ART) approach could be a realistic option to restore dentine carious lesions in this population and could also be used as a tool for long-term management of carious disease. This conclusion corroborates a previous recommendation to investigate the use of ART in people requiring special needs as an alternative to traditional care approaches when faced with behavioural difficulties [22].

The ART approach is framed by the Minimally Invasive Dentistry concept that aims to manage dental caries by providing optimal preventive care and minimally invasive operative interventions [23]. ART involves the removal of soft, completely demineralized carious tooth tissues with hand instruments, followed by the restoration of the cavity with an adhesive dental material (currently a high-viscosity glass-ionomer) that simultaneously seals the remaining pits and fissures. In addition to the restorative aspect, the ART approach includes a preventive aspect through sealing caries-prone pits and fissures with a high-viscosity glass-ionomer, the so called ART sealant [24]. The ART approach was introduced to the dental profession some 25 years ago and has always been research-driven, with over 190 research publications covering all aspects of the technique since its inception [25]. ART has been adopted by the WHO as part of its Basic Package of Oral Care (BPOC) [26]. The use of ART has, however, been little reported in populations with disability [21].

For any new procedure to be applied in a healthcare system, its suitability and acceptance amongst patients and care providers should first be investigated. The present study was designed to obtain the opinions of experts in special oral care regarding the suitability of the ART approach for restoring dentine carious lesions in patients with disability.

Material and methods

Study design

Information regarding the suitability of the ART approach was obtained through a semi-structured questionnaire that was presented to a group of international Special Care Dentists attending an academic meeting on Disability and Oral Health.

Questionnaire development

No questionnaire was available in the literature regarding the perception of Special Care Dentists on the suitability of the ART approach for managing dentine carious lesions in patients with disability. Therefore, a questionnaire had to be developed. The prototype was developed in English by the authors. This was then submitted to five Special Care Dentists from different countries with full command of the English language. Feedback resulted in the second draft which was developed by the authors with assistance from a biostatistician. This draft was presented to a focus group of 10 Special Care Dentists from Córdoba, Argentina, who had a good command of the English language. Feedback resulted in the final questionnaire that was presented to 30 delegates representing 21 different countries during the International Association of Disability and Oral Health Task Force Meeting (SCiPE) in Antalya, Turkey, hosted by the Association of Dental Education in Europe in September 2011.

The questionnaire consisted of three sections. Questions were related to: (1) background information from the respondents regarding age, gender, country of residence, year of graduation, experience in treating patients with disability and their views regarding treating caries in this population (six questions); (2) specific information about the respondents' knowledge, attitude and behaviour regarding the use of the ART approach (four questions); and (3) strengths, improvements and barriers of ART (three questions) in people with disability. All questions had proposed answers except the question on barriers, which was open-ended.

Statistical analysis

Data were entered into Excel[®] and analysis was undertaken by a biostatistician from the Dental School in Nijmegen, the Netherlands. Frequency distributions of variables were calculated and a Chi-Square test was applied to test for differences between variables. Considering the sample size, no multi-level analysis was performed.

Results

Background information

A total of 30 participants (100% response rate), 18 females and 12 males, representing 21 different countries (11 from European countries, four from South America, two from North America and two from Oceania) responded. Eighty per cent of respondents had been working in the field of Special Care Dentistry for 10 years or more. Dental services to people with disability were provided full-time by 26.7% of respondents, between 3–4 days a week by 43.3% and 1–2 days a week by 30% of respondents

Table I. Respondents.

Number of participants	30	
Number of countries represented	21	
World regions represented	Europe (11), Asia (4), South America (2), North America (2), Oceania (2)	
Proportion of females	18	60%
Experience		
Less than 5 years	2	6.7%
5–9 years	4	13.3%
10 or more years	24	80.0%
Days a week treating patients with disability		
1–2 days a week	9	30.0%
3–4 days a week	13	43.3%
5+ days a week	8	26.7%

(Table I). In asking the experts for the most important aspects to consider when treating dentine carious lesions in patients with disability, 96.7% responded ‘avoiding pain’, 90% stated ‘providing a sustainable restoration’ and 86.7% opted for ‘using reliable restorative materials’ and ‘the speed of producing a restoration’ (Table II).

Knowledge, attitude towards and the use of ART (Table III)

All respondents reported having some knowledge of the ART concept. The majority reported having full (23.3%) or moderate (63.3%) knowledge of ART. The majority of experts (66.7%) indicated that the ART approach may play an important role in restorative care for people with disability, although nine required further evidence (30%) and one was unsure. Regarding the question of how often they were currently using ART, 10% responded very often, 40% often, 30% rarely and 20% responded never. All five continents were represented in the expert group, but there was an uneven distribution of respondents:

Table II. Aspects considered important when treating children or adults with disability.

	Frequency (n = 30)	Percentage
Avoid pain	29	96.7%
Provide sustainable restorations	27	90.0%
Use reliable restorative procedures	26	86.7%
Speed of restorative procedures	26	86.7%
Avoid noise	22	73.3%
Avoid drilling procedures	18	60.0%
Others (minimally invasive procedures)	4	13.3%

Table III. Knowledge, attitude and behaviour concerning ART.

	Frequency (n = 30)	Percentage
<i>Knowledge of ART</i>		
Full	7	23.3%
Moderate	19	63.3%
Vague	4	13.3%
<i>Could ART be a reliable alternative strategy in special needs patients?</i>		
Yes	20	66.7%
Need more scientific evidence	9	30.0%
Don't know	1	3.3%
<i>If reliable scientific evidence showed the effectiveness of ART in this population would you use it?</i>		
Yes	25	83.3%
Don't know	5	16.7%
<i>How often do you use ART?</i>		
Very often	3	10.0%
Often	12	40.0%
Rarely	9	30.0%
Never	6	20.0%

23 came from developed countries and only seven from developing countries, as defined by the International Monetary Fund Advanced Economies list [27]. There was no significant difference in the use of ART between respondents from developing and developed countries ($p = ns$). In addition, current use of ART was not found to be related to gender, experience or reported relative importance of certain factors for a restoration ($p = ns$). Current use of ART was not related to knowledge nor to the respondents perception of the utility of ART in this population ($p = ns$). The majority of respondents felt that they would be more likely to consider using ART if positive scientific evidence became available (83.3%), although five respondents were still unsure. There was a significant difference between the 50% using the technique and those not using it, in the replies to this question

Table IV. Reported strengths of the ART approach.

	Frequency (n = 30)	Percentage
Avoids using the drill	27	90.0%
Patient acceptance	25	83.3%
Avoids local anaesthesia	24	80.0%
Uses fluoride-releasing restorative materials	24	80.0%
Avoids general anaesthesia	23	76.7%
Arrests cavitated lesions	21	70.0%
Others (minimally invasive procedures)	5	16.7%

Table V. Reported aspects of ART needing further development when used in children or adults with disability.

	Frequency (<i>n</i> = 30)	Percentage
Improvement of the interface cavity/restorative material	26	86.7%
Facilitation of decayed tissue removal in difficult situations	24	80.0%
Improvement of restorative materials	24	80.0%
Time spent for an acceptable outcome	16	53.3%
Patient acceptance	13	43.3%
Others	2	6.7%

($p < 0.05$), with five respondents (33.3%) not currently using ART replying that were not sure that they would use it even if there were positive evidence (reply: I don't know) compared to none of the regular users.

Strengths, improvements and barriers of ART

The answers to the question related to strengths, improvements and barriers of the use of ART in people with disability are presented in Tables IV–VI, respectively. ‘Avoiding using the drill’ (90%) was the characteristic that was most often cited as a strength of ART. ‘Improved adhesion of glass ionomer to the cavity wall’ (86.7%) was the item that was most often cited as an aspect that needed further development. ‘Placing and following up restorations under difficult conditions’ was the most cited barrier (36.7%) for introducing ART as a reliable caries management concept in children and adults with disability. No significant difference was found between those currently using ART or not, for opinion of the strengths of the technique or for opinion of aspects that require further development. The only barrier that was significantly different between users

Table VI. Perceived barriers to the use of ART in children or adults with disability.

	Frequency (<i>n</i> = 30)	Percentage
Placing and following up restorations under difficult conditions	11	36.7%
Pre-conception of a lower quality dentistry	9	30.0%
Lack of knowledge or scientific evidence	8	26.7%
Fear of leaving decayed tissue behind	7	23.3%
Poor longevity of restorations or restorative materials	6	20.0%
Dentists preference for using high technology	3	10.0%
Not included in social insurance/ Prefer using sedation and conventional approach	3	10.0%

and non-users was that of preconception of ART being a ‘lower quality’ of dentistry ($p < 0.05$)—this was cited as a barrier to the introduction of the technique by seven out of 15 regular users of the technique compared to two out of 15 non-users.

Discussion

This study demonstrated that experts in Special Care Dentistry report high levels of knowledge regarding ART (87% with full or moderate knowledge) and positive attitudes towards the technique (67% felt it was a reliable strategy). However, in terms of behaviour only 50% of respondents used the technique regularly. Given the high level of scientific evidence in favour of the ART technique when used in other populations [25], the gap between knowledge, attitudes and behaviour in this small group of experts is surprising. The majority of respondents identified aspects of restorative treatment for children and adults with disability compatible with the use of ART (Table II). Over 70% of respondents were also able to identify the major strengths of the technique, all of which are particularly relevant to the population requiring special care where behaviour management issues are often paramount. The fact that ART can be provided without the need for local anaesthesia, without the need for drilling, and that it provides a fluoride-based restoration plus a fissure sealant in one rapid session should, at least on paper, make it the ideal technique for use in patients requiring special care [28,29]. So why was the use of this patently ‘Atraumatic’ technique not more widespread?

The respondents identified certain aspects of the technique that require further development, including doubts as to the reliability of the restorative materials and the difficulty of providing rapid but high-quality treatment in difficult situations. Thirty per cent felt that further scientific evidence is required to support the use of ART in this population. This is a laudable attitude and clinical research in the field of disability and oral health has been raised as a major issue to improve the evidence that underlies our daily practice as well as the teaching at the undergraduate and postgraduate level [30]. However, it is important to note that there is virtually no evidence base for any therapeutic strategies for managing dental caries in children and adults with disability [21]. It would, therefore, seem that behavioural barriers to the clinical application of ART by special care dentists lie more in clinical tradition and professional norms than in any truly objective criticism of the technique. This theory is supported by the fact that five respondents in the present study who do not currently use ART were still unsure if they would do so even if ‘reliable scientific evidence showed the suitability and effectiveness of the ART approach in this population’.

It might be hypothesized that professionals from developed countries may use ART less frequently and perceive it less favourably than those from developing countries, as they may have alternative solutions to compensate for problems of co-operation such as access to sedation and general anaesthesia facilities. This hypothesis was not supported by the data of this small study as there was no difference in use of ART between respondents from developed or developing countries.

In the current study, respondents were asked an open-ended question as to the perceived barriers of the use of ART and were able to answer freely. The free answers were then grouped according to content into seven points. The most frequently cited barrier was the placement of restorations under difficult conditions—although any type of restoration can be assumed to be difficult to place in this population when co-operation is limited. The use of ART does not preclude the use of conscious sedation. It is true that the ART technique requires the restoration to be placed into a saliva-free cavity and this reply might therefore be related to the common conception that amalgam placement is more ‘forgiving’ of local environment. Dentists may be sceptical about the longevity of glass ionomer restorations, although there is now ample evidence in the literature for the use of these materials [25,31]. Similarly, reticence may be shown to the incomplete removal of decayed dentine. Eighty per cent of the dentists replying to this survey qualified over 15 years ago and it is likely that they were all taught that decayed dentine has to be entirely removed. Scientific opinion regarding this problem has changed with the development of the Minimally Invasive Dentistry concept, but application of the new philosophy is slow even within dental universities [32,33]. Most dentists will understandably prefer to stay with ‘tried and trusted’ techniques that they feel confident with. This is probably even more true when managing patients where the dentist has to be quick and efficient and may not be able to follow-up or replace restorations easily. This inertia may be compounded by social health systems that do not recognize or reimburse ART treatment.

The most interesting of the barriers cited was the ‘preconception of lower quality dentistry’, cited by 30% of respondents. Somehow in the professional and probably in the public psyche, highly technical, preferably expensive, treatment has become synonymous with ‘quality’. Why should ART be considered a ‘third world’ ‘second rate’ treatment? The Primary Health Care Approach was developed by the WHO in 1978 and includes clear statements about the use of appropriate, sustainable technology and the importance of prevention in the reduction of health inequalities [34]. The development of ART has followed these guidelines faithfully, so why should this simple, effective, evidence-based public health measure be

shunned for fear of ‘downgrading’? This preconception is particularly surprising as systematic reviews have reported no difference in survival rates of single-surface ART and amalgam restorations in both primary and permanent teeth [35,36]. It would seem that the major issues in oral public health have yet to reach the surgery or office where treatment decisions are being made, even in the domain of special care dentistry where professionals are on the forefront of the battle against health inequalities.

The current study obviously has its limits. A small convenience sample of dentists was consulted and the questionnaire was not designed to provide a full qualitative analysis of the question. However, it may be assumed that dentists attending a special interest group meeting might be amongst those who tend to keep up-to-date with techniques and therapeutic strategies. Unfortunately, the questionnaire did not ask if the respondents had received any formal training in the technique, as this might have increased knowledge and experience and reduced reticence. It has always been emphasized that training is necessary in order to be able to use the technique efficiently and appropriately [25]. It is also likely that the Hawthorne effect was in play—i.e. that the respondents gave replies they thought would please the investigator, who was known to the group. In which case, knowledge, attitudes and use of ART may be poorer in reality than those reported.

It is clear that the ART approach has limitations as well as advantages for use in the population with disability, in the same way that conventional treatment has pros and cons. However, it is evident that a well-designed clinical trial would be a major contribution to determine the efficacy, feasibility and longevity of ART restorations placed in adults and children with disability. Further research is also necessary to identify groups of patients for whom this technique might be the most beneficial, in particular the dependent elderly, pre-co-operative children, patients with intellectual or mental disability and management difficulties and the severely medically compromised. This study confirms the need for such research in order to aid practitioners in their therapeutic choices.

Conclusion

The 30 experts in Special Care Dentistry included in this questionnaire study reported high levels of knowledge regarding ART and positive attitudes towards the technique. However, in terms of behaviour only 50% of respondents used the technique regularly. Barriers to the implementation of ART in practice were placement of the restoration under difficult conditions and the dentist’s pre-conception of the technique as being ‘lower quality dentistry’. Experts suggested that some of these barriers might be overcome by improving the evidence base in favour of the

technique, specifically in the population with disability.

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References

- [1] Stiefel DJ, Truelove EL, Martin MD, Mandel LS. Comparison of incoming dental school patients with and without disabilities. *Spec Care Dentist* 1997;17:161–8.
- [2] Hawkins RJ. Functional status and untreated dental caries among nursing home residents aged 65 and over. *Spec Care Dentist* 1999;19:158–63.
- [3] Naidu R, Pratelli P, Robinson P, Gelbier S. The oral health and treatments needs of adults with a learning disability living in private households in Lambeth, Southwark and Lewisham, London. *J Disabil Oral Health* 2001;2:78–82.
- [4] Yip KHK, Smales R. Root surface caries in elderly people in residential care. *J Disabil Oral Health* 2004;5:70–6.
- [5] Nunn JH. The burden of oral ill health for children. *Arch Dis Child* 2006;91:251–3.
- [6] O'Leary I, Kinirons M, Graham F, Harnett C. Oral disease experience of adults with severe disability prior to receiving dental treatment under general anaesthesia. *J Disabil Oral Health* 2006;7:173–5.
- [7] Hennequin M, Moysan V, Jourdan D, Dorin M, Nicolas E. Inequalities in oral health for children with disabilities: a French national survey in special schools. *PLoS One* 2008;3:e2564.
- [8] Hennequin M, Faulks D, Roux D. Accuracy of estimation of dental treatment need in special care patients. *J Dent* 2000;28:131–6.
- [9] Anders PL, Davis EL. Oral health of patients with intellectual disabilities: a systematic review. *Spec Care Dentist* 2010;30:110–17.
- [10] Faulks D, Hennequin M. Defining the population requiring special care dentistry using the International Classification of Functioning, Disability and Health. A personal view. *J Disabil Oral Health* 2006;7:143–52.
- [11] World Health Organisation. International Classification of Functioning, Disability and Health (ICF). Geneva: Switzerland: WHO; 2001.
- [12] Gordon SM, Dionne RA, Snyder J. Dental fear and anxiety as a barrier to accessing oral health care among patients with special health care needs. *Spec Care Dentist* 1998;18:88–92.
- [13] Stiefel DJ, Mandel LS. Perceived barriers vs dental care availability for persons with disabilities. *J Dent Res* 1991;70:337.
- [14] Lennox NG, Diggins JN, Ugoni AM. The general practice care of people with intellectual disability: barriers and solutions. *J Intellect Disabil Res* 1997;41:380–90.
- [15] Cumella S, Ransford N, Lyons J, Burnham H. Needs for oral care among people with intellectual disability not in contact with Community Dental Services. *J Intellect Disabil Res* 2000;44:45–52.
- [16] Nunn J, Freeman R, Anderson E, Carneiro LC, Carneiro MSA, Formicola A, et al. Inequalities in access to education and healthcare. *Eur J Dent Educ* 2008;12:30–9.
- [17] Tiller S, Wilson KI, Gallagher JE. Oral health status and dental service use of adults with learning disabilities living in residential institutions and in the community. *Community Dent Health* 2001;18:167–71.
- [18] Escribano Hernández A, Hernández Corral T, Ruiz-Martín E, Porteros Sánchez JA. Results of a dental care protocol for mentally handicapped patients set in a primary health care area in Spain. *Med Oral Patol Oral Cir Bucal* 2007;12:E492–5.
- [19] Lee P-Y, Chou M-Y, Chen Y-L, Chen L-P, Wang C-J, Huang W-H. Comprehensive dental treatment under general anesthesia in healthy and disabled children. *Chang Gung Med J* 2009;32:636–42.
- [20] Stanková M, Buček A, Dostálová T, Ginzlová K, Pacáková Z, Seydlová M. Patients with special needs within treatment under general anesthesia - meta-analysis. *Prague Med Rep* 2011;112:216–25.
- [21] Molina GF, Leal SC, Frencken JE. Strategies for managing carious lesions in patients with disabilities - a systematic review. *J Disabil Oral Health* 2011;12:159–67.
- [22] Holmgren CJ, Figueredo MC. Two decades of ART: improving on success through further research. *J Appl Oral Sci* 2009;17(Suppl):122–33.
- [23] Tyas MJ, Anusavice KJ, Frencken JE, Mount GJ. Minimal intervention dentistry—a review. FDI Commission Project 1-97. *Int Dent J* 2000;50:1–12.
- [24] Frencken JE, Pilot T, Songpaisan Y, Phantumvanit P. Atraumatic restorative treatment (ART): rationale, technique, and development. *J Public Health Dent* 1996;56:135–40; discussion 161–3.
- [25] Frencken JE, Leal SC, Navarro MF. Twenty-five-year atraumatic restorative treatment (ART) approach: a comprehensive overview. *Clin Oral Investig* 2012;16:1337–46.
- [26] Frencken JE, Holmgren CJ, Van Palenstein Helderman WH. Basic package of oral care. Nijmegen: WHO Collaborating Centre for Oral Health Care Planning and Future Scenarios; 2002.
- [27] International Monetary Fund. World Economic Outlook: tensions from the two-speed recovery. Washington DC (US): International Monetary Fund Publication Services; 2011. p 1–221. Available online at <http://www.imf.org/external/pubs/ft/weo/2011/01/pdf/text.pdf>. Accessed 21 November 2012.
- [28] Collado V, Nicolas E, Hennequin M. Dental difficulty for adult patients undergoing different dental procedures according to level of dental anxiety. *Odontostomatol Trop* 2008;31:35–42.
- [29] Oosterink FMD, de Jongh A, Aartman IHA. What are people afraid of during dental treatment? Anxiety-provoking capacity of 67 stimuli characteristic of the dental setting. *Eur J Oral Sci* 2008;116:44–51.
- [30] Daly B. Editorial: research in special care dentistry. *J Disabil Oral Health* 2011;12:146–8.
- [31] Molina GF, Cabral RJ, Frencken JE. The ART approach: clinical aspects reviewed. *J Appl Oral Sci* 2009;17(Suppl):89–98.
- [32] Tubert-Jeannin S, Doméjean-Orliaguet S, Riordan PJ, Espelid I, Tveit AB. Restorative treatment strategies reported by French university teachers. *J Dent Educ* 2004;68:1096–103.
- [33] Frencken JE, Peters M, Manton D, Leal SC, Gordan V, Eden E. Minimal intervention dentistry for managing dental caries. A review. *Int Dent J* 2012;62:223–43.
- [34] World Health Organisation. Declaration of Alma Ata. «Health for all» series no.1 Geneva: Switzerland: WHO; 1978.
- [35] Frencken JE, Van 't Hof MA, Van Amerongen WE, Holmgren CJ. Effectiveness of single-surface ART restorations in the permanent dentition: a meta-analysis. *J Dent Res* 2004;83:120–3.
- [36] Mickenautsch S, Yengopal V, Banerjee A. Atraumatic restorative treatment versus amalgam restoration longevity: a systematic review. *Clin Oral Investig* 2010;14:233–40.