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GUEST EDITORIAL

Frequency of radiological review in pulp studies

The *International Endodontic Journal* is constantly striving to raise standards in endodontic research, and it is therefore appropriate to review published papers and seek out best practice.

In recent years, a number of papers have been published on the use of mineral trioxide aggregate in primary pulp treatment. Table 1 lists eight studies published in the last 4 years. It is likely that they were all designed and carried out at a similar period and without reference to each other. The nature of research is to investigate the unknown, so what are considered to be appropriate periods for radiological review? The American Academy of Pediatric Dentistry (2005) published guidelines that gave no advice on this issue. The UK National Clinical Guidelines in Paediatric Dentistry (Llewelyn 2000) advised annual radiographs for primary tooth pulpotomy, the UK National Clinical Guidelines in Paediatric Dentistry (Rodd *et al.* 2006) advised regular review of primary molar pulp therapy, but did not specify time intervals; and the European Society of Endodontology (2006) quality guidelines for endodontic treatment advised an initial review at 6 months; these last guidelines were focused on permanent tooth pulps rather than primary teeth.

If the eight studies are analyzed, Table 1 reveals two studies with a first radiological follow-up at 1 month, followed by one at 3 months and then 6 months. Neither of these studies detected any problem at any time interval. There were three studies with the first follow-up at 3 months then 6 months; four failures were noted at 3 months out of a total of 210 teeth. By 1 year the number of failures was 19 of 210. There were three studies with the first follow-up at 6 months then 1 year; one failure was detected at 6 months out of 118 teeth. Combining all the studies detected a 7% failure rate. Therefore the information about an adverse response gained from radiological evaluation is low. The 3-month radiograph is rarely useful and therefore the radiation, especially in young children, is not justified. With hindsight the UK National Clinical Guidelines in Paediatric Dentistry (Llewelyn 2000) offer the most acceptable guidance given the need to be aware of the UK justification of practices involving ionising radiation regulations (UK Government 2004). This requires the overall benefits of practices which might result in the exposure of people to ionising radiation, to be weighed against the harm likely to be caused by the radiation exposure.

Conclusion

It is to be hoped that the research community will take up the challenge to design better clinical studies that yield the most information from the least intervention to patients, and that guidelines will be more specific

Table 1 Summary of recent primary molar pulp studies

Author	Radiological times (months)	Materials	No. start	No. end	Timing of radiological disease months (*n*)	Clinical success
Holan *et al.* (2005)	6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72	MTA/FC	64	56	6 (1) T (6)	90
Saltzman *et al.* (2005)	3, 6, 9, 16	MTA/FC	52	20	3 (1) 6 (1) 9 (5) 16 (4)	81
Naik & Hegde (2005)	1, 3, 6	MTA/FC	50	47	(0)	100
Percinoto *et al.* (2006)	3, 6, 12	MTA/CH	110	90	6 (2) 12 (3)	91
Aeinehchi *et al.* (2007)	3, 6	MTA/FC	126	100	3 (1) 6 (6)	100
Maroto *et al.* (2007)	6, 12, 18, 24, 30, 36, 42	MTA	69	26	42 (1)	100
Noorollahian (2008)	6, 12, 24	MTA/FC	60	36	24 (1)	100
Tuna & Olmez (2008)	1, 3, 6, 9, 12, 18, 24	MTA/CH	50	44	(0)	100
Total				419	3 (2) 6 (10) [T = 30, 7%]	

CH, calcium hydroxide; FC, formocresol; MTA, mineral trioxide aggregate.

about follow-up times. It is especially important to avoid unnecessary radiation in young children.

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References

Aeinehchi M, Dadvand S, Fayazi S, Bayat-Movahed S (2007) Randomized controlled trial of mineral trioxide aggregate and formocresol for pulpotomy in primary molar teeth. *International Endodontic Journal* **40**, 261–7.

American Academy of Pediatric Dentistry (2005) Guidelines on pulp therapy for primary and young permanent teeth. *Pediatric Dentistry* **28**, 144–8.

European Society of Endodontology (2006) Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *International Endodontic Journal* **39**, 921–30.

Holan G, Eidelman E, Fuks AB (2005) Long-term evaluation of pulpotomy in primary molars using mineral trioxide aggregate or formocresol. *Pediatric Dentistry* **27**, 129–36.

Llewelyn DR (2000) Faculty of Dental Surgery, Royal College of Surgeons. UK National Clinical Guidelines in Paediatric Dentistry. The pulp treatment of the primary dentition. *International Journal of Paediatric Dentistry* **10**, 248–52.

Maroto M, Barbería E, Vera V, García-Godoy F (2007) Mineral trioxide aggregate as pulp dressing agent in pulpotomy treatment of primary molars: 42-month clinical study. *American Journal of Dentistry* **20**, 283–6.

Naik S, Hegde AM (2005) Mineral trioxide aggregate as a pulpotomy agent in primary molars: an *in vivo* study. *Journal of the Indian Society of Pedodontics and Preventive Dentistry* **23**, 13–6.

Noorollahian H (2008) Comparison of mineral trioxide aggregate and formocresol as pulp medicaments for pulpotomies in primary molars. *British Dental Journal* **204**, E20.

Percinoto C, de Castro AM, Pinto LM (2006) Clinical and radiographic evaluation of pulpotomies employing calcium hydroxide and trioxide mineral aggregate. *General Dentistry* **54**, 258–61.

Rodd HD, Waterhouse PJ, Fuks AB, Fayle A, Moffatt MA (2006) Faculty of Dental Surgery, Royal College of Surgeons. UK National Clinical Guidelines in Paediatric Dentistry. Pulp therapy for primary molars. *International Journal of Paediatric Dentistry* **16**(Suppl.1), 15–23.

Saltzman B, Sigal M, Clokie C, Rukavina J, Titley K, Kulkarni GV (2005) Assessment of a novel alternative to conventional formocresol-zinc oxide eugenol pulpotomy for the treatment of pulpally involved human primary teeth: diode laser-mineral trioxide aggregate pulpotomy. *International Journal of Paediatric Dentistry* **15**, 437–47.

Tuna D, Olmez A (2008) Clinical long-term evaluation of MTA as a direct pulp capping material in primary teeth. *International Endodontic Journal* **41**, 273–8.

UK Government (2004) *The Justification of Practices Involving Ionising Radiation Regulations (2004)* SI 2004 No 1769.

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