Management of caries in young children. Have we been barking up the wrong tree?

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INTRODUCTION

Over the last decade there has been much debate not only about the oral health benefits of restoring carious primary teeth but also what might be the best way of providing care. Both these points of discussion within the profession were triggered by research published from the United Kingdom (Tickle et al, 2002, Innes et al, 2006).

The study by Tickle et al 2002, was greeted with outrage by Paediatric Dentists. This study on whether to restore decayed primary teeth at all has been dismissed because the discussion, conclusions and extrapolation of the results by the authors was far-fetched, speculative and not a true reflection of the methodology and the results of the study. The most important conclusion of the study that there was no difference in the outcome measures of pain, extractions etc. between teeth that were restored or left unrestored cannot stand up to scrutiny because the quality of the restorations performed in the teeth to which the unrestored teeth were compared was unspecified. However, this publication triggered a European wide debate and many countries such as UK, Ireland, Netherlands and Denmark have questioned the traditional and conventional approaches for management of caries in young children.

The second controversial issue regards the approach for the management of caries in children. The high prevalence of dental caries among Scottish children and it's inadequate management drove Dr. Hall to look for alternative approaches for managing carious primary teeth that would be simpler, more acceptable to children and parents and yet effective as the conventional restorative approaches (Innes et al., 2006). In 1988, Dr. Hall had introduced placing preformed metal crowns (Hall PMCs) on carious primary teeth. The technique has been referred as Hall Technique. Again, despite the outrage expressed by many paediatric dentists, research has shown this technique to be effective in the control of caries. An audit of Dr. Hall's records together with two RCTs based in primary care supported her findings and found the technique acceptable to the children, their parents and the GDPs (Innes et al., 2006, 2007 and 2011).

So the question arises, what are the future directions for management of caries in children who are unfortunate to get severe disease in the primary dentition? Should the profession dismiss these studies that have questioned the established paradigm or should we examine the evidence carefully and if this evidence proves to be compelling then question ourselves and the way we provide care for children. The aim of this article is to examine this controversial issue and to suggest a way forward.

DOES EUROPE HAVE A CARIES PROBLEM IN ITS CHILD POPULATION?

We have some of the best data for the dental disease experience in children for the whole of Europe. In particular, in the United Kingdom through a tradition of dental health surveys carried out every 10 or so years we have been able to clearly see the longitudinally emerging trends nationwide. Over the last 30 years, these surveys

have provided us with figures which have been interpreted by the academics in Dental Public Health and politicians alike to convey to the world the tremendous dental health that children of the United Kingdom enjoy. But these headline statistics mask the high levels of disease borne by many children, usually from deprived backgrounds, the burden of managing which falls upon the shoulders of the clinicians on the coal face. The situation is exactly the same in most developed and developing countries where dental caries levels increase many fold with increasing deprivation quintiles. Socioeconomic factors have been found to be an important predictor for causing dental caries in children in several countries, with children living in deprived areas (including immigrants) more vulnerable to dental diseases. Many of these children were either not motivated to seek dental treatment or experienced barriers in obtaining it (Tapias-Ledesma MA., et al 2001; Wennhall et al., 2001; Marthaler, 2004; Oulis et al., 2012; Santamaria et al., 2014). The findings suggest initiatives should be directed to bringing children from deprived backgrounds under the umbrella of dental care.

In summary despite the progress in the global oral health status seen in the last decade, dental caries is still a common disease among children and adolescents (Marthaler, 2004). Nearly 46% of 4-year-old children are affected by dental decay (Stecksén-Blicks et al., 2004) with a disturbing trend of an increasing prevalence of dental caries among children in some developed countries such as Norway where an annual increase of 3.3% was reported from 2000 to 2004 (Bagramian et al., 2009). In countries such as Denmark and Sweden, traditionally considered as world leaders in engineering a decline of caries in their populations, no improvements in the distribution of dental decay for the period between 1987 to 2002 in 4 and 5-year olds children have been reported (Haugejorden and Birkeland, 2002; Marthaler, 2004;Stecksén-Blicks et al., 2004).

WHAT ABOUT EQUALITY AND QUALITY OF DENTAL CARE? ARE WE EFFECTIVELY TREATING CHILDREN WITH CARIES?

Some readers will be surprised to know that even in a rich and affluent European country such as the United Kingdon, the published Care Index for 5 year old children (Pitts et al, 2005), reflecting the percentage of caries that is treated with restorative care, is less than 20 percent. Even for 11 year old children, where only caries in the permanent teeth at the level of dentin was considered, the care index on average was around 41% but could be as low as 20% in some parts of the country (Pitts et al, 2006), meaning that in some areas four out of five permanent decayed teeth where caries was into dentin were not being restored. These figures should send a shiver down the spine of every dental health professional, who believes that dentistry is a caring profession. How can we condone the non treatment of a disease that carries such a high morbidity and knowingly put the child at risk of pain and suffering? In a wealthy nation like the UK, where Health Services are extremely well organised, if this is the existing situation, what might be the case in poorer countries? The fact remains that in most countries there is neither equality or high quality care provided for most children who get dental caries across all spectrums of socio-economics. In our opinion, this raises an important question? What is an acceptable quality of care that we can advocate for children who are still afflicted with disease in our societies? What is the definition of "quality" in restorative paediatric dentistry?

WHAT IS "QUALITY" DENTAL CARE THAT IS ACCEPTABLE BASED ON EVIDENCE?

For most of us who are "die hard" paediatric dentists a high quality restorative care for children with caries revolves around conventional treatment which involves local analgesia, and the placement of restorations with or without pulp therapy. There are two questions which need to be addressed:

1. Is it necessary always to restore carious primary teeth for every child?
2. Do "posh" fillings equate to high quality?

IS IT NECESSARY ALWAYS TO RESTORE CARIOUS PRIMARY TEETH FOR EVERY CHILD?

Within the practice of the professions these days there is now a legal entity known as a 'duty of care'. This means that, in dentistry, every dentist who takes on a patient for dental care/treatment must make every effort to ensure that the patient receives a proper standard of care. In paediatric dentistry there remains some degree of controversy as to what such a term means. The problem arises because of two factors. Firstly children are not always easy to care for because of differing levels of co-operation and secondly because the primary teeth eventually exfoliate. Therefore, any restorative treatment that is needed must be of limited duration. Adding the two entities together many dentists have taken the view that there is no need to carry out restorations in primary teeth but to leave them to be shed

as and when the permanent teeth erupt.

The most important conclusion of the study published by Tickle et al, (2002) was that there was no difference in the outcome measures of pain, extractions etc. between teeth that were restored or left unrestored cannot stand up to scrutiny because the quality of the restorations performed in the teeth to which the unrestored teeth were compared was unspecified. Other studies have shown that untreated caries in young children, especially preschoolers carries a high morbidity, including pain (Levine et al, 2002; Shepherd et al, 1999). A most recent study (Pine et al, 2006) clearly showed that the proportion of children with sepsis increases markedly with caries experience and this problem can be mitigated if more caries is treated. The authors, who based their findings on a sample of nearly seven thousand 5-year-old children in Scotland, concluded rightly that the findings of their study would not support a policy of non-intervention for deciduous teeth. It is obvious that when the presenting complaint is that of sepsis, the tooth is more likely to be extracted. Milsom et al (2003) showed that extraction in pre-school children was highly likely to be associated with fear of dental procedures. This in my view is as strong an argument as any for good quality restorative care for carious primary teeth, with restorations that are performed to standards that do not circumvent the basic principles of restorative dentistry, as is often the case when primary teeth are restored in general dental practice.

DO "POSH" FILLINGS EQUATE TO HIGH QUALITY?

There is ample evidence in the literature to show that primary teeth restored following principles of good restorative practice do very well indeed and excellent success rates have been reported (Mass et al, 1999; Fuks et al, 2000). Many argue that in western nations restorative interventions in primary dentition are not evidence based.

We must question some of the options we exercise as clinicians for children who bear the biggest burden of dental caries. For many such young children full mouth rehabilitation requires the use of general anaesthesia. Bearing in mind that most of these children are from socio-economically disadvantaged backgrounds, and are least likely to comply with preventive protocols, what is the wisdom of carrying out extensive restorative care under GA? Has this approach been ethical and cost effective? Children with dental caries treated under G.A, tend to have a high susceptibility to future caries development, "relapse", due to the poor parents' compliance, unfavourable eating practices, and unsupervised oral hygiene practices after dental rehabilitation under G.A.

Indeed, very high and unacceptable failure rates of restorative treatment provided under GA have been reported consistently in the literature. In a retrospective study (Almeida et al, 2000), 79% of carious children treated under G.A had detectable carious lesions at 6-9 months recall visits over a 2 year period. On the other hand, only 29% of caries-free children developed new lesions, although parents were provided with dietary counselling, oral hygiene instructions and general dental education. In addition, 17% required retreatment under G.A after 2 years following their initial dental rehabilitation.

Foster et al, (2006), assessed the likelihood of the recurrence of dental decay following comprehensive treatment under G.A in a sample of 193 children aged 19-60 months. Within 2 years, over half the children in the study presented with new carious lesions despite the aggressive treatment approach followed at the dental hospital. Children were provided with oral hygiene instructions, dietary counselling, and post-operative instructions for follow up care as well as been scheduled for immediate 2-week follow up appointment and ongoing 6 month recall visits. "Relapse" was more likely to occur among children (33.7%) who failed to attend their immediate follow-up appointment, particularly in the primary dentition. In addition, children who attended their follow-up appointment were less likely to have developed new caries lesions in their primary teeth (15%) than those who failed to attend (31.6%). The authors concluded that children receiving dental rehabilitation under G.A are unlikely to seek follow-up and are likely to relapse.

In our opinion there is evidence in the literature that should make us question our treatment approaches. Unless preventive protocols are enforced, followed and supported by parents the likelihood of complex restorative approaches being successful is low. Given the high costs associated with such interventions it is important that as health care professionals we not only question the cost effectiveness of these complex approaches but also consider the ethics of providing treatment that has been shown to have high failure rates.

CAN THERE BE AN ALTERNATIVE APPROACH FOR SOME CHILDREN?

The traditional restorative approach has been challenged recently by those who have argued in favour of the so called "biological" approach. This approach involves less invasive

techniques that aim to re-shift the metabolic balance within the dental biofilm, thus promoting remineralization and arresting the carious lesion (Schwendicke et al., 2013). Use of glass ionomers for stabilisation of caries could be used as an intermediate approach in many children whilst their cooperation and compliance is assessed. However, it must be remembered that the use of GIC is not indicated for proximal lesions and high failure rates have been reported when used in multi-surface lesions. Placement of pre-formed metal crowns using the Hall technique has been recommended but also opposed by several prominent paediatric dentists. Hall Technique seals dental caries into the tooth by means of PMC and its cement with no caries removal, local anaesthesia or even tooth preparation. It alters the carious lesion environment to no longer favour cariogenic biofilm progression (Innes et al., 2007).

Despite some advantages the Hall Technique has over the conventional restoration, the technique is not without limitations. It is not suitable for every child with carious primary molars; therefore proper case selection is significantly important. The very anxious or the very young child might not be able to cope with biting on a rigid metal crown through potentially tight contact points. In addition, Hall crowns are contraindicated for primary molars with signs and symptoms suggestive of irreversible pulpitis. Conventional pulp therapy or extraction remains the treatment options for such cases (Innes et al., 2006; Innes and Evans, 2013). An ideal indication for Hall Technique is a primary molar with early to moderately advanced active dentinal caries affecting the proximal surface with no signs or symptoms of irreversible pulpal involvement (Innes et al., 2006, Innes and Evans, 2013). The occlusion might be altered after fitting the Hall PMC, due to lack of tooth reduction prior to PMC fitting. However, it was claimed that the occlusion tends to equilibrate by the next recall appointment and no TMJ pain or problem tends to occur (Innes et al., 2006).

Date from RCT's is now available for the use of PMC with the Hall technique. Hall Technique was compared to the conventional restoration in a general dental practitioner split-mouth RCT conducted over 5 years period (Innes et al., 2007 and 2011). The authors concluded that both conventional restoration and Hall Technique can be provided to the vast majority of the children.

Recent studies in Leeds have shown that outcomes over 77 months for teeth treated with the conventional approach were similar to those treated with the biological approach. The overall clinical success rate for the conventional approach was 94% compared to 91.4% for the biological restoration (Bani Hani, Deery and Duggal, 2015, In Press). Interestingly the cost of treatment in the biological treatment group was significantly lower as compared with the cost of providing conventional treatment.

CONCLUSIONS AND RECOMMENDATIONS FOR THE FUTURE

There is one important consideration that should be highlighted. If the socio-economically deprived bear the larger burden of disease, then it is obvious that this state of economic deprivation also means that they will not access dental care as readily as more affluent in society. So it is important that the focus of health care provision in any country reflects this reality. Programmes that target those who are most vulnerable in our society should be taken forward and implemented. Also, although good quality restorative care is essential young dentists should also learn the forgotten art of prevention and public health. Alas, too many of our young students wish to the practitioners of the "art" of dentistry rather than the "science" of dentistry. Dental schools must teach all students their ethical responsibilities, their duty towards their profession, to the patients and to society. No profession will ever gain prominence if the sole object of those professionals is self-centred development and financial motives. We all owe a debt to our society and country which we must fulfil in our own small way through caring ethically for those under our care.

Of course it would be great to have results from a prospective randomised control study for various treatment options, but until one is carried out we cannot sweep under the carpet the overwhelming evidence of the longevity of those restorations and techniques for primary teeth that are performed to the highest standards of principles of restorative dentistry. Wedging a dollop of glass ionomer between cavity walls after inadequate removal of caries without local analgesia is not good quality restorative dentistry and it is no surprise that such restorations fail frequently further precipitating the myth that restorations in primary teeth don't work as well as in the permanent. Children deserve better. Dentists need to be better trained in the diagnosis of the state of pulp in response to proximal caries in primary molars. It was shown three decades ago (Hobson, 1970) and more recently again (Duggal, 2002) that pulp inflammation sets in early especially for proximal caries, and precedes the exposure of the pulp. A high failure rate of restorations in general dental practice is a reflection that many such teeth are restored without due consideration to the pulp inflammation, longevity of restorative materials

or principles of cavity design. Teeth with proximal caries are usually restored with conventional restorations when they should have been restored after pulp therapy (pulpotomy) has been carried out to remove the inflamed part of the primary dental pulp. This would certainly put an end to the myth that that the restoration of primary teeth is futile.

However, due consideration should be given to a more "biological" approach for management of some children with severe caries. Use of hall technique should not be dismissed as there is evidence supporting its use. As professionals if we ignore evidence due to long held beliefs, we open ourselves to criticism for being dogmatic and following an "unscientific" approach.

We have been unable to find any convincing evidence in the literature that leaving untreated primary teeth would not cause at least discomfort and in many cases pain and suffering for the children. Any funding organisation would have to appraise itself of this ethical dilemma before committing to funding such a trial. It would be more prudent to compare the traditional way primary teeth are restored in general dental practice with the way that would be advocated by specialist Paediatric Dentists in a prospective setting. Such a trial would be useful and would also win the support of those clinicians who feel that children deserve the best possible care for the restoration of their dentition. It is more than likely that the majority of children in the world will be treated in general dental practices in the near future and not by specialists. Only a small percentage of children will be treated in specialised paediatric dentistry practices. We must ensure that those children who still get caries do not suffer further from the provision of poor care and its consequences. Specialists in hospitals treat children on a daily basis with severe facial infections caused by poor restorations, placed with a disregard to restorative principles, or a non-interventionist "keep under observation" approach. This has implications for the child's immediate well-being, future attitudes and also has serious cost implications for the health services or a cost burden for families where health services are not provided by the state. Majority of emergencies can be averted by simple interventions thus avoiding a traumatic event in a child's life that might have a lifelong negative impact on their dental attitudes. So what are the responsibilities of specialist Paediatric dentists? Paediatric dentists must provide ethical specialist care for those children who are not easily treated in general practice. These include children with behaviour management issues, medically compromised children, children with developmental and genetic anomalies such as Amelogenesis Imperfecta or Hypodontia, and management of traumatic injuries in children. But more importantly Paediatric Dentists should set an example for everyone by upholding ethical practice and providing leadership in implementation of public health programmes targeting those in our society who are unfortunate to still suffer from preventable dental disease.

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