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Dowsing, P. and Benson, P.E. (2006) Molar band re-use and decontamination: a survey of specialists. *Journal of Orthodontics*, 33 (1). 30 - 37. ISSN 1465-3125

<https://doi.org/10.1179/146531205225021366>

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Molar Band Reuse and Decontamination – A Survey of Specialists

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Keywords: Orthodontics; decontamination; survey;

Abstract

Objective: To determine pattern of use and re-use of orthodontic molar bands and examine infection control measures

Design: Questionnaire survey

Subjects and Methods: Questionnaires were sent to 204 individuals selected at random from the Specialist Orthodontist list. Follow-up questionnaires were sent to those that had not replied within 8 weeks. An overall response rate of 74.5% was achieved.

Main outcome measures: Orthodontic band use and re-use and infection control.

Results: The reported rates of pre-sterilisation cleaning and sterilisation of orthodontic instruments were 92% and 100% respectively. 90% of respondents were using bands for molar teeth with the remainder routinely used bonded attachments. 95% of clinicians using bands routinely re-used them after being tried-in with 5% discarding them. Pre-sterilisation cleaning of reused molar bands was carried out by 92 percent of respondents who reclaimed bands. Sterilisation of these bands was then carried out by most specialists apart from two.

Conclusions: The majority of specialist orthodontists in the UK are adhering to universal precautions for cross-infection control and are carrying out approved decontamination procedures. The majority are also reusing orthodontic bands that have been tried in the mouth, but found to be the wrong size. The great diversity of reported procedures for decontamination of instruments and bands suggest that more research is required to provide guidelines into the most effective method.

Introduction

The placement of bands on molar and premolar teeth is a common orthodontic practice; however several bands may be used on a patient before an accurate fit is obtained. The discarding of bands that have been tried-in the mouth and found to be the incorrect size would have enormous cost implications to the NHS, but there are few guidelines concerning the necessary procedures to adequately clean and sterilise the bands for reuse.

The dental profession has introduced universal precautions to address the issue of cross-infection control¹, therefore all patients should be treated as if they were potentially infectious. It is a legal, as well as an ethical and professional responsibility of practising clinicians to ensure that all equipment that has been in actual, or potential contact with oral or other body fluids is disposed of following recommended guidelines; or, if reused undergoes an adequate sterilisation procedure to enable total destruction or denaturation of potentially harmful micro-organisms and other contaminants.

There are three stages to the decontamination process¹:

- Pre-sterilisation cleaning
- Sterilisation
- Storage

Recommendations for the initial cleaning process include removal of the contaminant by hand, the use of an ultrasonic bath and disinfectant, enzyme-based cleaning solution or instrument washer. Current guidelines¹ advocate the use of the steam autoclave as the method of choice for sterilisation of all dental instruments.

Orthodontists have been found to be less compliant with recommended cross-infection control procedures than both general dentists² and other dental specialties³. A previous survey⁴ of 189 British orthodontists found that 41 percent were sterilising bands with gluteraldehyde.

The aims of this investigation were to determine the pattern and extent of reuse of molar bands following try-in and the methods used for their cleaning and sterilisation. In addition, the general infection control measures relevant to safe orthodontic practice were examined.

Materials and Methods

Study group selection

The study sample was chosen from the 1018 specialist orthodontic practitioners whose names appear in the specialist register held by the General Dental Council in the United Kingdom. The sample size was based on an anticipated response rate of seventy percent from specialist orthodontic practitioners and comprised of 204 individuals chosen using a random method in which the list was split into blocks of five names and a random number table was used to choose which practitioner was included.

Questionnaire

A 25-item self-reported questionnaire was designed. Questions were divided into three subsections. The first section assessed demographics to determine the sample population characteristics. The second section inquired into general cross infection control procedures including cleaning, sterilisation and training. The third section dealt with the pattern of orthodontic band use and reuse following size determination.

Initially the questionnaire was pre-piloted prior to seeking ethical approval. A small pilot study was then carried out involving six specialist orthodontic practitioners to assess the acceptability of the questionnaire, which was modified following constructive suggestions.

Specialist orthodontists were allocated a coding to aid identification of responses and facilitate follow-up mailing to those who didn't respond initially. In December 2003, the questionnaire, a covering letter and a stamped addressed envelope were mailed to the sample individuals. Each letter was addressed personally and signed. Emphasis was placed on the importance of practice-based research to support their clinical decisions. Replies were collected over an eight-week period and duplicate questionnaire with modified covering letter and new stamped address envelope posted to those who failed to respond to the initial request. The second batch was distributed in February 2004 and replies were collected over a further 8-week period.

Data Handling and Statistical Analysis

Data collected were entered into Microsoft Excel. Twenty questionnaires were chosen at random and were re-checked to verify accuracy of data entry. Data analysis involved descriptive statistics.

Results

Figure 1 shows a flow diagram outlining the response rate at each stage of the survey. A total of 152 questionnaires were returned representing a response rate of 74.5 percent. During the initial 8-week data collection period, 111 replies were received with a further 41 during a subsequent follow-up period. Five respondents stated that they were no longer carrying out active orthodontic treatment, therefore a total of 147 responses (65% male and 35% female) were assessed (Figure1). Due to the design of the survey, it was not possible to identify

individuals who failed to respond so no estimation could be made of non-response bias. No significant differences were identified among responses received within the first eight weeks (early respondents) and those received after follow-up (late respondents) except early responders were statistically more likely to have attended a recent course on cross infection control than late responders (41% compared with 23%).

Demographic Data

The mean year of basic dental qualification was 1979 (range 1959-1995). No significant differences were observed between those whose basic training was less than or equal to 20 years ago and those who had been qualified more than 20 years. The majority of respondents (91%) had a specialist orthodontic qualification and 50 percent also held the equivalent of a masters degree. The average year of qualification for M.Orth. was 1994 (range 1986-2002) and for D.Orth. was 1981 (range 1963-1993).

The majority (62%) worked primarily in specialist orthodontic practice. Thirty two percent spent most of their time within the hospital service and the remainder (6%) worked in the community service. The majority of respondents (67%) provided a combination of both NHS and private care, however 31 percent were providing care solely within the NHS and only 2 percent were solely private. The number of cases completed on average per year was 243 with a range of 15-1000. These are similar proportions to a recent national survey of the orthodontic workforce⁵ and therefore should be an accurate representation of the profession.

General Infection Control Procedures

Routine wearing of gloves and facemasks by all members of the dental team was used as a measure of compliance with established cross infection control measures. There was excellent observance with glove wearing as 97 percent of respondents stated that all members of their

team routinely wore gloves, however only 33 percent complied with facemask wear. With regard to eye protection 91 percent said that they routinely provided this for patients, whereas 76 percent of orthodontists and only 44 percent of assisting nurses routinely used it.

The vast majority of clinicians provided their dental nurses with training in cross infection control (99%). This was usually from another dental nurse (83%), but 61 percent responded that their nurses also went on a postgraduate course. Over half of specialists (58%) also reported being involved in cross infection control training, although only a minority had attended a recent course or meeting concerned with cross-infection control (36%), with an average time lapse of 9.0 months (range 1-36 months).

General Decontamination Procedures

The reported rate of pre-sterilisation cleaning of orthodontic instruments was 92 percent. Five percent (7 individuals) stated that they did not carry out any pre-sterilisation cleaning with the remainder not stipulating.

There were a large variety of different methods of pre-sterilisation cleaning outlined. The majority of those who carried out a pre-sterilisation cleaning were using an ultrasonic cleaner (47%), a washer/disinfector (13%) or a combination of the two (14%). A minority (24%) were relying on a pre-soak or hand washing only. The time taken for pre-sterilisation was on average 11¾ minutes (range 1-60 minutes).

All the people who responded to the questionnaire were carrying out sterilisation of orthodontic instruments, although five people gave no response to this question. The methods of sterilisation used by the respondents are shown in Figure 2. All respondents were using an acceptable method of sterilisation. The commonest method was a conventional steam

autoclave (63%), followed by a vacuum-phase autoclave (24%) and 8 percent stated that they were using a combination of conventional steam autoclave and vacuum-phase autoclave. Hot air ovens are no longer considered a satisfactory method for sterilising dental instruments and no one in this survey was using a hot air oven alone, however two respondents were using the hot air oven in combination with a steam autoclave or a vacuum phase autoclave. The average sterilisation time was reported to be 11.8 minutes (range 3-90 minutes).

Orthodontic Band Reuse and Decontamination

The majority of respondents (90%) were using bands for molar teeth. Fifteen individuals (10%) reported that they routinely used bonded attachments and were therefore excluded from the rest of the survey.

The majority of clinicians who banded molars routinely reused the bands after they had been tried-in the mouth and found to be the wrong size (95%). Six clinicians stated that they discarded the bands, four of these individuals worked in the hospital environment with the remaining two working in specialist practice. Three respondents reported that they used plain bands without any buccal tube attachments and all discarded these bands. Three respondents also discarded bands with buccal tube attachments after they had been tried-in.

Pre-sterilisation cleaning of reused molar bands was carried out by 92 percent of respondents who reclaimed bands. Once again there was a great diversity of methods (Table 1). The majority of clinicians used an ultrasonic cleaner either with a pre-soak or handwashing (42%). The next most popular form of pre-sterilisation cleaning was a pre-soak or hand wash combination (30%); followed by a washer/disinfector (17%) and 7 percent used a combination of ultrasonic cleaner and washer disinfector.

When asked if sterilisation was routinely carried out on either plain bands or those with buccal tubes after try-in and before further use, 124 gave a positive response but two individuals stated that this was not common practice, therefore implying that sterilisation was not carried out routinely on tried-in bands.

The majority of respondents were using either a conventional steam or vacuum-phase autoclave (89%) to sterilise their reused bands (Figure 3), however the remaining respondents were using sterilisation procedures that are no longer recommended for dental instruments¹.

Figure 4 shows the factors determining reuse of tried-in molar bands. The majority of respondents (86%) thought cost was an important factor deterring them from discarding bands. The next most important factor was lack of guidelines (37%), followed by wastage (9%), recent evidence suggesting that there is no cross-infection risk (3%) and how distorted/damaged the band was (1%).

Discussion

This survey of British specialist orthodontists has found that most are using and reusing bands for molar teeth. The majority were cleaning and sterilising their bands according to current guidelines before reuse, but there was a great diversity of methods, showing that there is no consensus on the best way to achieve decontamination.

Compliance with general cross-infection control guidelines was generally good within this group. The reported proportion of members of the dental team wearing gloves for all patients was 97 percent. This shows that there has been a considerable improvement in glove wearing over 15 years as Evans⁴ found only 21 percent of British orthodontists wore gloves for all

patients and 33 percent never wore gloves. This figure is also comparable with a recent report that 91 percent of Scottish general dental practitioners⁶ wore gloves for all procedures.

Compliance with the wearing of masks and eye protection for clinicians, especially dental nursing assistants was lower than with glove wearing, although eye protection was provided for the majority of patients. McCarthy et al² found that orthodontists in Canada were significantly less likely than general dentists to change gloves after every patient, wear masks and use protective eyewear. They suggest that this was because orthodontists believe that they are less frequently exposed to aerosols and spatter, however 18 percent of orthodontists in their survey reported blood splashes to the eyes, nose or mouth in the previous year, indicating the need to wear protection for these areas.

Woo et al⁷ suggest that orthodontists believe they are at a lower risk for infectious disease than other dentists because they treat mainly children and adolescents, who are less likely to be infectious. However this is contrary to the principle of universal precautions, which perceives all patients to be potentially infectious and therefore should be treated in the same way. There is also a change in the profile of patients presenting for orthodontic treatment, with more adults being prepared to wear appliances.

The vast majority of orthodontists provide training in cross-infection control to their staff and many get involved in the training personally. This compares favourably with the 92 percent of Scottish GDPs who provide formal training for their nurses⁶.

The majority of orthodontists in the survey were complying with the decontamination guidelines for their instruments¹. It is considered essential to remove blood and saliva before

placement in an autoclave otherwise the effectiveness of the sterilisation procedure is reduced. Nearly half of respondents were using an ultrasonic cleaner to pre-wash instruments before sterilisation. It is of interest that Lowe et al⁶ found no GDPs in their survey were using the newer and more effective washer disinfectors for pre-sterilisation cleaning, however more than one in four orthodontists were using them either alone or with an ultrasonic cleaner. Nearly one quarter of the respondents were relying on a pre-soak or hand washing to clean the instruments. Ultrasonic cleaners and washer disinfectors are considered more efficient and reduce the risk of needlestick injuries¹.

All the responders to this survey reported sterilising their instruments and also declared that they were using either a conventional downward displacement autoclave or the newer vacuum-phase autoclave, which are the methods of choice¹. None was using a hot air oven, chemical or ultra-violet methods, which are no longer considered acceptable methods for sterilising dental instruments. The results of this survey compare very favourably with that of McCarthy et al² who found that only 46 percent of Canadian orthodontists were using an autoclave compared with 72 percent of general dentists and the remainder were using either chemical sterilisation or disinfection and dry heat. They suggest that orthodontists were reluctant to use a steam autoclave because it can cause rusting and corrosion of orthodontic pliers and dulling of cutting edges.

The majority of respondents were using and reusing bands. Only 5 percent reported that they threw away bands that had been tried-in the mouth and therefore used new bands for every patient. This compares with 7 percent of GDPs who used a new matrix band for every patient⁶. The main barrier to discarding tried-in molar bands was cost, as it was with the GDPs, who were also concerned about the time it takes to replace matrix bands.

Three clinicians reported that they were using plain bands because of the potential problems of sterilising the lumen and headgear tube of the bracket. A recent study⁸ has found that there was no bacterial growth from bands that had been tried-in the mouth, cleaned by immersion in an enzymatic disinfectant and sterilised in a bench top steam autoclave. They concluded there was little risk of cross infection from the reuse of bands that have been adequately cleaned and sterilised. It therefore seems unnecessary to use plain bands or discard tried-in bands.

There was a wide diversity of methods employed for the decontamination of bands, showing a lack of clear guidance in this area. It was also found that 7 percent of respondents were not using an approved method of pre-sterilisation all of the time. The method of pre-sterilisation cleaning is important in determining how well the blood and saliva are removed from the band and therefore how effective the sterilisation procedure is. Lowe et al⁹ found that following ultrasonic cleaning 6 percent of matrix bands were found to be contaminated with blood compared with 34 percent of hand scrubbed matrix bands. More research is required to determine the most effective methods of decontaminating molar bands and to help formulate guidelines for effective practice.

The situation of reusing tried-in molar bands is complicated by the fact that they are marked for single use only. The Medical Devices Agency defines reuse as ‘repeated episodes of use of a device in circumstances which make some form of reprocessing necessary’¹⁰. Manufacturers mark orthodontic bands with the CE mark which indicates they are for single use only. Trying-in of these bands for sizing purposes may constitute use and the subsequent sterilisation and re-try may invalidate the CE mark. Manufacturers are now beginning to address this issue.

Difficulties with investigating the sensitive issues such as cross infection control may encourage specialist practitioners to provide the perceived ideal response as opposed to report actual true life practice. Unfortunately this means that data relating to compliance with existing regulations may be flawed. We hope to have addressed this issue by ensuring that all replies have been analysed anonymously.

Conclusion

- The majority of specialist orthodontists in the UK are adhering to universal precautions for cross-infection control with regard to the wearing of gloves for the treatment of patients, but not the wearing of masks or eye protection particularly for their DSAs
- The majority are reusing orthodontic bands that have been tried-in the mouth, but not used for treatment.
- The majority are carrying out approved decontamination procedures; although the great diversity of procedures carried out suggest that more research is required to provide guidelines into the most effective method of decontamination.

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Table 1

Table showing the diversity of methods used to clean reused bands before sterilisation.

Presterilisation Cleaning Method	n	%
Pre-soak only	5	4%
Hand cleaning only	16	13%
Pre-soak; Hand cleaning	15	13%
Ultrasonic cleaner only	21	18%
Hand cleaning; Ultrasonic cleaner	16	13%
Pre-soak; Hand cleaning; Ultrasonic cleaner	13	11%
Washer/disinfector only	6	6%
Pre-soak; Washer/disinfector	4	4%
Hand cleaning; Washer/disinfector	4	3%
Pre-soak; Hand cleaning; Washer/disinfector	5	4%
Ultrasonic cleaner; Washer/disinfector	3	3%
Hand cleaning; Ultrasonic cleaner; Washer/disinfector	1	1%
Pre-soak; Hand cleaning; Ultrasonic cleaner; Washer/disinfector	3	3%
Not Stated	5	4%
Total	117	100%

Figure 1

Flow diagram showing the numbers of responses at each stage of the survey and reasons for exclusion.

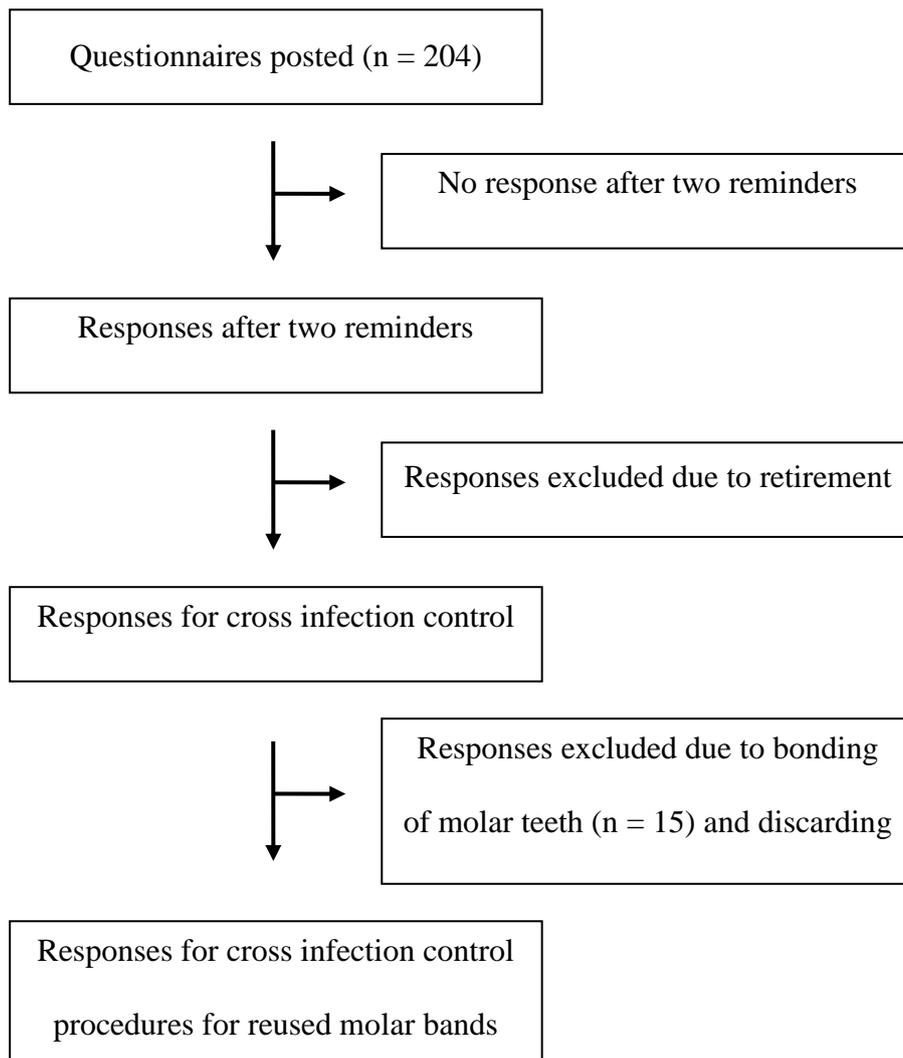


Figure 2

Graph showing the general sterilisation methods used by specialist orthodontists for orthodontic instruments.

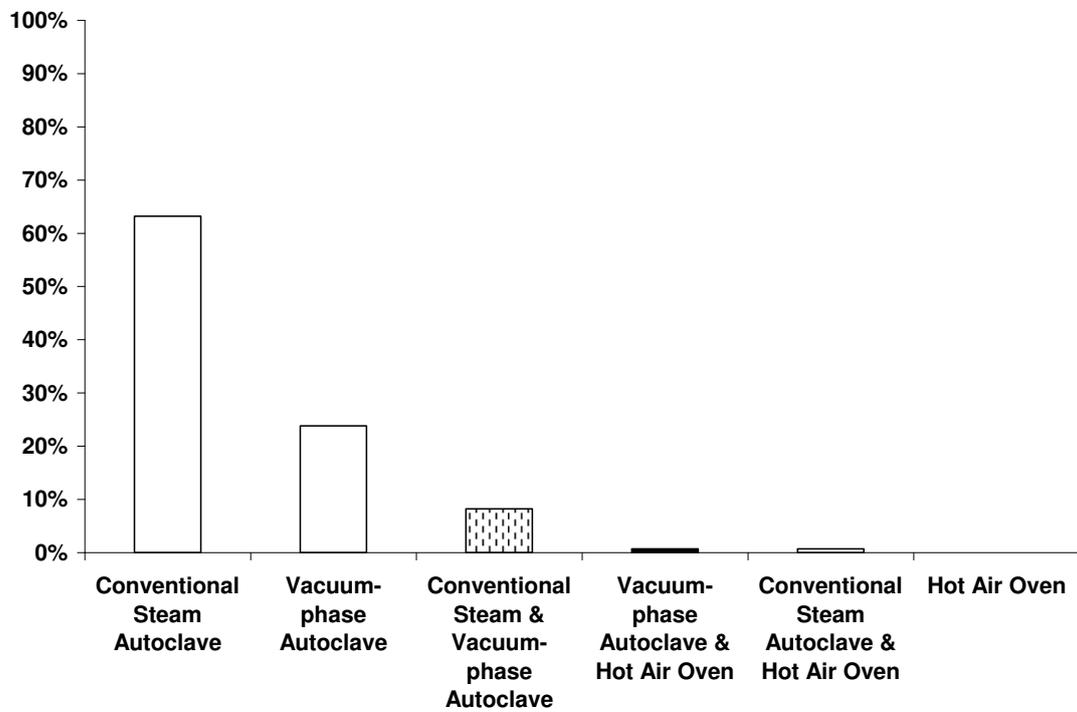


Figure 3

Graph showing the methods used for sterilising reused bands by specialist orthodontists.

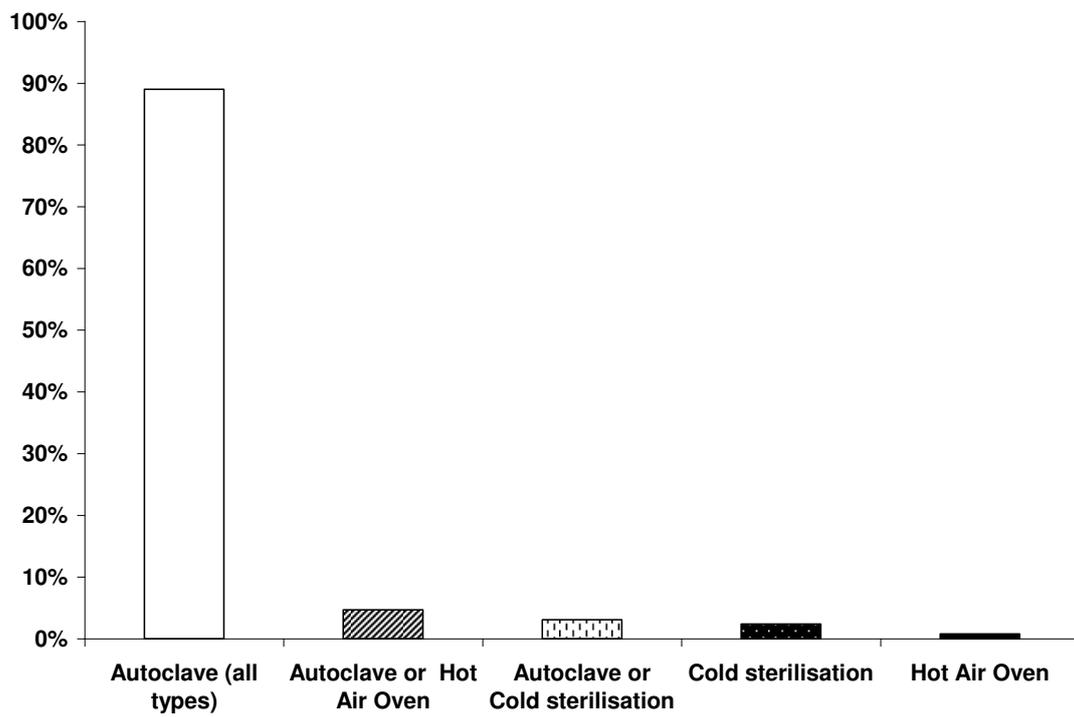


Figure 4

Graph showing the reasons given by specialists for not discarding orthodontic molar bands after trying them for size (more than one answered allowed).

