

Orthodontic Material Usage Among Malaysian Orthodontists (Kegunaan Bahan-bahan Ortodontik di Kalangan Pakar Ortodontik di Malaysia)

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ABSTRACT

Fixed orthodontic treatment requires the use of orthodontic brackets and archwires in order to correct malocclusions. The objective of this study was to evaluate the pattern of orthodontic material usages i.e. bracket and archwire among Malaysian orthodontists. A self-administered questionnaire was distributed to members of the Malaysian Association of Orthodontist. Data entry and statistical analysis was done using SPSS version 15.0. Descriptive statistics were used for analysis. Means and standard deviations were calculated for continuous variables, frequency and percentages for categorical variables. Thirty-four orthodontists responded to the survey, with 76% (n=26) were female and the mean age was 43.31 years (SD 8.76). Most respondents used conventional metal brackets (60%, n=60) and most bracket prescription used was MBT (56%, n=19). At levelling stage, most respondents used nickel titanium archwire (84.5%, n=47). Stainless steel archwire was the most favourable choice for retraction/space closure stage (73.9%, n=34). At finishing, most respondents (60.4%, n=29) preferred to use stainless steel wire in their cases. As a conclusion, specific types of orthodontic materials were preferred and used by Malaysian orthodontists in delivering orthodontic treatment.

Keywords: Archwire; bracket; orthodontic; survey

ABSTRAK

Rawatan ortodontik tetap memerlukan penggunaan braket ortodontik dan wayar arkus untuk merawat maloklusi. Objektif kajian ini dijalankan adalah untuk menilai corak penggunaan bahan ortodontik iaitu braket dan wayar arkus di kalangan pakar ortodontik di Malaysia. Borang kaji selidik telah diedarkan kepada ahli Persatuan Pakar Ortodontik Malaysia. Maklumat kajian telah dimasukkan dan dianalisis menggunakan SPSS versi 15.0. Statistik deskriptif telah digunakan sebagai analisis. Purata dan sisihan piawai dikira untuk pembolehubah berterusan, frekuensi dan peratusan untuk pembolehubah mutlak. Tiga puluh empat pakar ortodontik membalas kaji selidik ini dengan 76% (n=26) adalah perempuan dengan purata umur 43.31 tahun (SD 8.76). Kebanyakan responden menggunakan braket logam konvensional (60%, n=60) dan preskripsi braket yang paling banyak digunakan adalah MBT (56%, n=19). Pada peringkat penyusunan gigi, kebanyakan responden menggunakan wayar arkus nikel titanium (84.5%, n=47). Wayar arkus keluli tahan karat merupakan wayar yang menjadi pilihan untuk peringkat penarikan/penutupan ruang. (73.9%, n=34). Semasa peringkat kemasan, kebanyakan responden (60.4%, n=29) gemar menggunakan wayar arkus keluli tahan karat untuk kes mereka. Sebagai kesimpulan, terdapat bahan ortodontik yang spesifik yang diutamakan dan digunakan oleh pakar ortodontik di Malaysia dalam memberikan rawatan ortodontik.

Kata kunci: Braket; ortodontik; tinjauan; wayar arkus

INTRODUCTION

In treating dental malocclusion, fixed appliances are usually recommended to patients. This type of orthodontic appliance involves the use of brackets and archwires. The combination of bracket-archwire will eventually move the malalign teeth into proper alignment thus correcting the malocclusion.

Brackets currently used in orthodontics are made from different types of material. These orthodontic brackets can also be classified based on its ligation methods and the built-in prescription. Each bracket designed has its own advantages and disadvantages. The conventional metal brackets are made from stainless steel alloy and need the use of elastomeric module for ligation. Ceramic brackets

offer better aesthetic but with the risk of fracture and increased friction during tooth movement (Reicheneder et al. 2007). The newer generation of bracket which does not require any conventional ligation are called self ligating brackets. Studies showed that these brackets has improved chairside time (Turnbull & Birnie 2007) and has less friction (Pandis et al. 2008) however at a higher cost.

Generally, there are three main treatment stages in orthodontic which are the levelling stage, retraction/space closure stage and the finishing stage. At different stages of orthodontic treatment, archwire are expected to behave in such that it can suit their function at that point in time. During the alignment stage, archwires should be flexible and exert light continuous force to move teeth

into alignment. This will ultimately decrease the risk of tissue hyalinization and undermining resorption which may lead to further patient's discomfort. However, during the retraction/space closure stage, archwire are expected to be rigid enough to maintain the patient's archform while engaging onto the force system applied such as the elastomeric chain. Currently, there is no single archwire that can be used for all the treatment stages.

Therefore, few types of archwires have been designed using different types of material. Stainless steel archwire has been the longest used archwire in the orthodontic world since late 1930s (Kusy 1997). It has been greatly used due to its high strength, higher elastic modulus and its corrosion resistance to the oral environment (Nikolai 1997). These archwire are usually needed during retraction/space closure stage of an orthodontic treatment. However, during the earlier stage of levelling and alignment, nickel titanium archwires has fulfilled the criteria needed i.e. flexibility and the 'shape memory' effect (Kusy 1997). Beta titanium or titanium molybdenum alloy (TMA) archwires are an optional wire used for minor tooth movement during finishing stage.

Thus, every brackets and archwires available in the market has its own advantages and disadvantages. Therefore, the objective of this study was to evaluate the pattern of orthodontic material usages i.e. bracket and archwire among Malaysian orthodontists.

MATERIALS AND METHODS

The study population consisted of all orthodontists registered as a member of the Malaysian Association of Orthodontist. A cross sectional study using a self-administered close-ended and open-ended questionnaire was distributed with an introductory letter. Confidentiality of the information provided was reassured and participation was voluntary. The first section of the questionnaire were designed to identify the demographic data of the respondents, mainly were age, gender, ethnicity, place and type of practice and years of orthodontic practice. This section also asked about the average number of new and review patient per month treated in their main practice. The second section has questions on the usage of orthodontic materials which consists of 2 parts. The first part evaluated the types of bracket used and the types of brackets' prescription. The second part evaluated the type of archwire used at 3 different stages of orthodontic treatment.

The questionnaire was pretested on five orthodontic postgraduate students. We found that the questionnaire was comprehensible and was postulated that they would have similar understanding.

Two reminders were sent to increase the response rate at one month intervals. Data entry and analysis was done using the SPSS version 15.0. Descriptive statistics were used for analysis. Means and standard deviations were calculated for continuous variables, frequency and percentages for categorical variables.

RESULTS

DEMOGRAPHIC DATA

Out of 93 questionnaires posted, only 34 orthodontists responded to this survey thus making the response rate of 37%. The demographic data is presented in Table 1. Most respondents were female orthodontists (76%). The mean age was 43.31 ± 8.76 years old. By ethnicity, there were 58% Malay respondents, 33% Chinese respondents while 9% were foreigners.

TABLE 1. Demographic data

| Demographic | N | % |
|-------------|----|------|
| Gender | | |
| Male | 8 | 23.5 |
| Female | 26 | 76.5 |
| Ethnicity | | |
| Malay | 19 | 57.6 |
| Chinese | 11 | 33.3 |
| Others | 3 | 9.1 |

Slightly more than half of the respondents practised in Kuala Lumpur and Selangor (58%). The remaining respondents practised in other parts of Malaysia 42% (Table 2). The average years of practice were 11.34 ± 7.9 years. On average, government orthodontists see more new patient of 12.95 ± 6.1 and review patients of 258.85 ± 65 per month. Meanwhile, the private orthodontists see only 5.5 ± 2.5 new patient and 117.5 ± 61.5 review patients.

TABLE 2. City/State of practice

| Place of practice | Total | |
|-------------------|-------|------|
| | (n) | % |
| Kuala Lumpur | 12 | 31.6 |
| Selangor | 10 | 26.3 |
| Melaka | 1 | 2.6 |
| Perak | 1 | 2.6 |
| Pulau Pinang | 1 | 2.6 |
| Negeri Sembilan | 1 | 2.6 |
| Johor | 3 | 7.9 |
| Pahang | 1 | 2.6 |
| Sarawak | 3 | 7.9 |
| Sabah | 2 | 5.3 |
| Kelantan | 1 | 2.6 |
| Kedah | 1 | 2.6 |
| Perlis | 1 | 2.6 |
| Total | 38 | 100 |

ORTHODONTIC MATERIAL USAGES

Types of Brackets The type of orthodontic brackets used are presented in Figure 1. Most respondents used conventional metal brackets (60%) while approximately 22% used ceramic brackets regularly. Only seven orthodontists (12.7%) stated that they used self-ligating brackets, two participants used plastic brackets (3.6%) and only one participant used lingual brackets (1.8%) frequently. When participants were asked regarding the use of bracket prescription, most of them answered either MBT (56%) or Roth (44%).

Type of Archwire Usages The result for the archwire usage is shown in Figure 2. During the levelling stage, most of the respondents used nickel titanium archwire (84.5%), followed by stainless steel wire (11%). Only two respondents used beta titanium archwire (TMA) for levelling (4%). Majority of the respondents used stainless steel archwire as the archwire of choice during retraction/

space closure stage (73.9%). The rest of the respondents used either nickel titanium archwire (10.8%) or TMA archwire (15.2%). During the final stage of orthodontic treatment (finishing), most respondents maintained the use of stainless steel wire (60.4%), while some orthodontists used TMA to finish their cases (22.9%). Minority of them used nickel titanium wire for finishing (16.6%).

DISCUSSION

The low response rate of 37% can be due to several reasons. The list of the orthodontist received from the Malaysian Association of Orthodontist was not up to date. Postal survey can also be one of the reasons for the low response rate as some of the respondents from the list may not be reached due to changes of workplace, resignation, retirement on sabbatical leave. Coverage errors occurs when the mailing list was incomplete, inaccurate or out of date (American Statistical Association 2000).

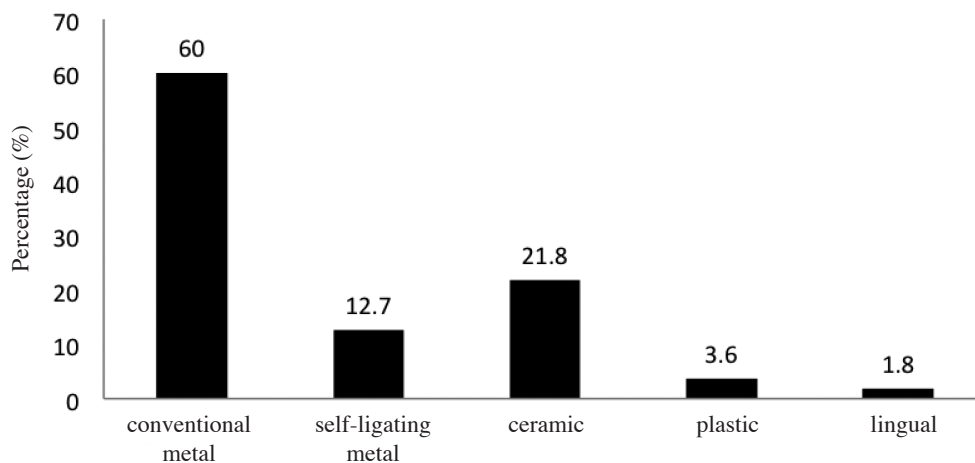


FIGURE 1. Types of bracket used by Malaysian Orthodontists

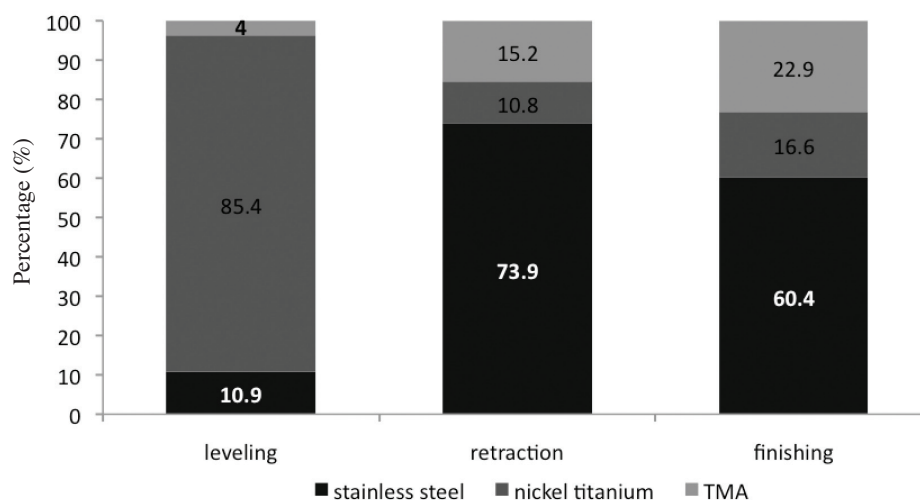


FIGURE 2. The types of archwire used during the 3 stages of orthodontic treatment i.e. levelling, retraction and finishing stage by Malaysian orthodontists

From demographic data collected in this survey, there were more female respondents rather than male orthodontist (Table 1) reflecting the distribution of female dental practitioners in Malaysia where 62% (n=1906) are practicing in both private and public sector (Oral Health Division. 2008). By ethnicity, the distribution of Malay respondents were more (n=19, 57.6%) compared to others (Table 1), reflecting the distribution of 47.8% (n=1512) Malay dentists practicing in both private and public sector (Oral Health Division 2008).

Many orthodontists practiced in urban areas such as Kuala Lumpur and Selangor. This may be due to the fact that orthodontic treatment is more affordable by the higher income group who lives in the urban area (Table 2). Because of the lower treatment cost in the Malaysian government clinic, more patients were treated there compared to the private counterpart (Table 3).

From this survey, metal brackets were commonly used in Malaysia (60%). These metal brackets are the cheapest orthodontic brackets available in the Malaysian market compared to other types of brackets such as ceramic or polycarbonate. Furthermore, current conventional metal brackets demonstrated good bracket properties such as rigid (Harzer et al. 2004), acceptable friction and retentive.

Ceramic brackets, a 'nicer-looking' type of bracket came second in the list of brackets used by respondents in this survey. However, many problems have been reported associated with these brackets. Frequent breakages (Odegaard 1989) and more frictional resistance (Angolkar et al. 1990) have been highly associated with these types of bracket. Furthermore, these brackets need special instrument or technique during debonding to prevent enamel fracture procedure (Bishara & Trulove 1990). These problems cause difficulties during orthodontic treatment and may contributed to the lower demand of aesthetic brackets in this survey (26%) compared to the conventional metal brackets (60%) (Figure 1).

Improvement in the orthodontics technology resulted in the production of newer generation of brackets system named self ligating bracket. These brackets require no elastomeric module ligation are shown to have some advantageous when compared to the conventional metal bracket. It has been found to reduce the colonization of pathogenic bacteria surrounding bracket (Pellegrini et al. 2009) which helps in reducing the risk of caries and periodontal problems in orthodontic patients. In addition, a study had shown that these brackets demonstrated less friction compared to the conventional metal bracket (Thomas et al. 1998). However, because of the higher cost for a self ligating bracket, the demand is low (12%) when compared to conventional metal and ceramic brackets (Figure 1).

Currently there are many brackets prescription available in world's market such as the Roth, MBT, Damon and Alexander (Matasa 1994). In Malaysia, our survey found that only two bracket prescriptions were frequently used namely the Roth (44%) and MBT (56%) (Figure 2) although other prescriptions such as Andrew was asked.

There are 3 main orthodontic treatment stages which are the levelling, retraction/space closure and finishing stage. The objective of a levelling stage is to align the dentition and relieve of crowding thus facilitate the second stage i.e. retraction stage. A flexible archwire which has springback potential and shape memory effect will be the most suitable archwire during this first stage (Nikolai 1997). These characteristic exhibited by archwire made from nickel titanium. Therefore, as reflected in this study, most respondents used nickel titanium archwire as the levelling archwire (85%). During the second stage of an orthodontic treatment where sliding mechanic are required, stainless steel archwire will be recommended in most cases (Kusy 1997). Stainless steel has high strength which can maintain the patients' archform during force application. Most respondents seemed to agree with this statement thus selecting stainless steel archwire as the wire of choice during retraction stage (74%). However, some of them do use nickel titanium (11%) and TMA (15%) as closing archwire.

During the last stage of an orthodontic treatment i.e. the finishing stage, minor wire bending may be needed in order to get better interdigitation whilst maintaining the original archform of a patient (Kusy 1997). However, the amount of wire bending may be different from case to case thus making a TMA a choice for more range and stainless steel for more stiffness as stated by Kusy in 1997. In our survey, most respondents still maintained the stainless steel archwire (60%) while a number of respondents revert back to a more flexible archwire such as the nickel titanium (17%) or TMA (23%).

CONCLUSION

Generally, Malaysian orthodontists preferred brackets which are durable, have good clinical performance at a reasonable cost. Malaysian orthodontists used different types of archwire at different stages of an orthodontic treatment i.e. nickel titanium archwires for levelling and stainless steel archwires during retraction and finishing stage. With the new development in materials of orthodontic brackets and archwires, changes in the pattern of bracket and archwire prescriptions by Malaysian orthodontists could be expected in the future.

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