

Cost analysis of patients treated with fixed and twin block appliances: part 2

Introduction

A person's quality of life (QoL) can be affected with poor oral health.¹ Measurement of oral health related quality of life (OHRQoL) helps professionals clarify the role of oral health status on the overall quality of life.² It also assists in clinical decisions taking into account patients' needs and serves as an effective communication mechanism with policy makers.^{3,4} Consequently modern healthcare systems should address patient's health complaints, taking into consideration the impact of patients' illness on quality of life.⁵ Modern dental procedures endeavour to improve patients' quality of life. Orthodontic treatment based on purely clinical and functional perceptions may not fully address patients' concerns. Patients and their parents have been shown to share similar treatment expectations, although parents reported more realistic prospects. Ethnicity significantly influences expectations for orthodontic treatment, and this may relate to differences in the patients' and parents' assessment of the clinical outcome. In the previous paper (part 1), the impact of fixed and Twin block appliances on OHRQoL was assessed, both groups demonstrated significant improvement toward the end of the treatment. However, in the current paper the economic analysis for Twin block and fixed appliances was performed. Economic evaluation is widely used and well accepted in the appraisal of health care. However in the field of orthodontics, there have been relatively few economic analyses performed.⁶

Material and methods

The study was conducted at the postgraduate university clinics within Mater Dei State Hospital. Research and ethical approvals for this study were granted from Mater Dei Hospital and University of Malta Research Ethics Committee. Participation was on a voluntary basis; potential patients and their guardians were explained the study details and encouraged to raise any concerns. Participants could withdraw at any point in the study without affecting their treatment. Interested patients/guardians were provided with a patient information package in their preferred language that is Maltese or English. Written consent was obtained. The clinical steps involved for the fixed appliances and Twin blocks removable appliances were explained to the parents/guardians. In cases involving extractions, further explanation and specific was obtained for the procedure. Inclusion criteria involved medically fit school children aged 10-16 years, who were non-syndromic, fully compliant, required simple extractions and had no previous orthodontic treatment. Exclusion criteria included patients below 10 years, and cases requiring headgear devices and surgical removal of teeth. IOTN-DHC (Dental Health Component) index main grades were used to categorize the patients' variety of treatment needs (e.g. differences in over jet, the presence of hypodontia, crossbites, open bites, impacted canines etc). We did not use IOTN-DHC to compare the severity for malocclusions. The principle clinician used the main grades of IOTN (DHC) to categorize each patient. Intra-examiner testing was performed. The investigator evaluated 10 casts/day allowing 20 minutes recess between each cast scoring. To verify the results a second experienced clinician evaluated the casts and an inter-examiner reliability test was carried out on randomly allocated

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50 casts. Table 1 shows the resources, source of data, and cost per unit used in the cost analysis for comparing the costs comparing fixed and twin block appliances. The initial costs of treatment and subsequent maintenance were collected from patient charts and documents. The initial costs included the fees of the orthodontic appliances, associated materials, clinicians and technicians' professional and time costs. Maintenance costs included the fees for repair of damaged appliances and replacement of components, and the clinicians' and technicians' professional and time costs. Patients' time costs were calculated by obtaining online the hourly income rate. On average, it was assumed that patient guardian/parent would use two hours away from the workplace to deliver the child to Mater Dei hospital. This assumption was based on the questioning of 20 parents. The treatment time was measured at an average of 30 minute per patient. Thus, the clinician's and nurses' time and clinical costs were calculated according to these averages.

The cost analyses were worked out by the following three mathematical formulas:

- Total treatment costs= total clinical costs + total time costs.
- Total clinical costs= initial treatment costs + maintenance costs.
- Maintenance costs= repair costs + materials + professional fees.
- Total time costs= (Salary Rate/hour) X (clinical time)

The cost effective ratio was calculated with the following formula:

$$\frac{Cost}{\Delta OHIP_n - \Delta OHIP_0}$$

Where:

Cost = total cost of fixed or Twin block appliances at the end of treatment

$\Delta OHIP_n$ = OHIP at any given point

$\Delta OHIP_0$ = base line

Table 1 Resources, data source and cost per unit

Resource	Data source	Twin block cost (€)	Fixed appliance cost (€)
Cost	Mater Dei Audit and finance Department	205	800
Repair of one Adams' crib	Dental Laboratory management services	20	—
Repair of labial bow	Dental Laboratory management services	12	—
Acrylic Resin	Dental Laboratory management services	15	—
Materials and disposables	Mater Dei Audit and finance Department	10	15
Repair of one brackets	Mater Dei Audit and finance Department	—	6
Orthodontic wires	Mater Dei Audit and finance Department	—	3
Senior orthodontic registrar hourly wage	Mater Dei Audit and finance Department	17	17
Assistant nurse hourly income	Mater Dei Audit and finance Department	8	8
Emergency	Mater Dei Audit and finance Department	As per case	As per case
Patient time cost	Maltese Ministry of Labor	As per guardian occupation*	As per guardian occupation*

(* patients' hourly wages were calculated from ministry of labour gadget grading system)

Statistical analysis

- a. A General Linear Model (GLM) for repeated measurements Analysis of Variance (ANOVA) was estimated to test differences of the means of an OHIP-14 outcome for the different follow-up periods or a cost variable according to the appliance group and type of malocclusion.
- b. Homogeneity of distributions of costs by IOTN class using Kruskal-Wallis test. Significance level used in analyses was set at a p value of <0.05.

Results

The costs associated with the treatment are presented in Figure 1. The overall average treatment costs were significantly higher for

the fixed groups (€ 1095.2±3.0) when compared to the Twin block group (€ 544.4±55.2) (Mann-Whitney p<0.001). The average clinical costs were constant for the fixed group since all patients were charged similarly. The mean clinical cost for the fixed group was € 817.8±1.5 and € 228.5±0.0 for the Twin block group. The average patients' time cost was significantly lower for the fixed group (€ 277.4±1.5) compared to the Twin block group (€ 315.9±55.2) (Mann Whitney, p<0.001). Figure 2 presents the average treatment and patient time costs based on IOTN-DHC grades. No significant differences for patients' time cost were observed (p=0.630). However, clinical and total costs were significantly higher for grades 4-5 with respect to grade 3 (p<0.001, Kruskal-Wallis test). The costs associated with the treatment are presented in Figure 1.

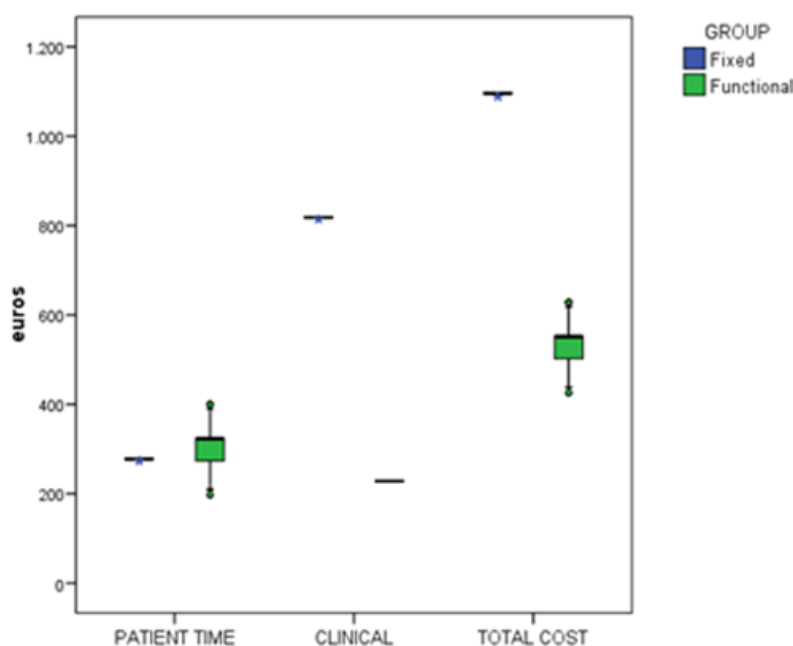


Figure 1 Average treatment costs with fixed and twin block orthodontic appliances.

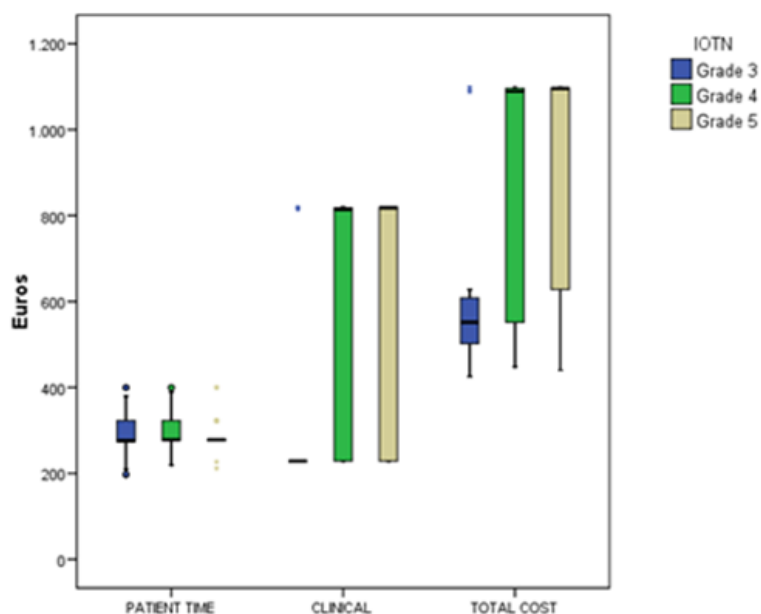


Figure 2 Average treatment and patient time costs based on IOTN-DHC grades.

Discussion

This study investigated the costs associated with fixed and Twin block appliances. The analysis is unique in comparing fixed and removable treatment options since these interventions were covered by NHS in Malta the use of the patient perspective provides meaningful insight into the economic burden imposed by these alternative forms of treatment. Costs and benefits usually take place at different time points and costs occur today and the benefits grow later on in the future. The economic analysis showed that the overall costs of Twin block appliances group was a cheaper option, at least when the said functional appliance resulted in the completion of treatment. One should observe that additional costs could be incurred in cases treated initially with functional appliances but requiring further treatment with fixed appliances. This point deserves further studies. The higher costs in patients treated with fixed appliances were still worth it as evidenced by the reported improvement in quality of life at the end of the treatment. On the other hand in young and growing patients, who have increased over jet or class II skeletal base malocclusions, a Twin block appliance can be viewed as the first treatment of choice since it is cheaper and will still result in an improved quality of life. Moreover, it could be considered as the only treatment necessary in certain clinical scenarios. We observed that the treatment costs for patients in IOTN grades 4 and 5 were higher in relation to patients classified in IOTN 3 grade. These findings provide clear evidence that more treatment costs should be anticipated in clinical cases with increasing complexity in orthodontic treatment needs. A cost effectiveness analysis failed to draw any conclusions. However, we observed that in the fixed appliances group, patient’s time costs were similar to each other. This result was due to the fact that most parents/ guardians’ annual income was close since they were categorized in grades (9), (8) and grade (10) salary scales. Patients’ time costs were lower for fixed appliance treatment. However, the clinical and total costs were higher for fixed

appliances. This was due to the fact that these patients required more repairs, reviews and more sophisticated instruments for treatment. The study suggests that the treatment with Twin block appliances was more cost effective when the patient’s situations dictate its use. Fixed appliances showed an improvement in OHRQoL but with higher costs in comparison to Twin block appliances.

Acknowledgments

None.

Conflicts of interest

Authors declare that there is no conflict of interest.

References

1. Preamble to the constitution of the World Health Organization as adopted by the International Health Conference. New York by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. World Health Organization; 1946.
2. Gift HC, Atchison KA. Oral health, health, and health-related quality of life. *Medical Care*. 1995;33(11 suppl):NS57–NS77.
3. Cunningham SJ, Hunt NP. Quality of life and its importance in orthodontics. *J Orthod*. 2011;28(2):152–158.
4. Jokovic A, Locker D, Guyatt G. How well do parents know their children? Implications for proxy reporting of child health-related quality of life. *Qual Life Res*. 2004;13(7):1297–1307.
5. Al Shamrany M. Oral health-related quality of life: a broader perspective. *East Mediterr Health J*. 2006;12(6):894–901.
6. Kumar S, Williams AC, Sandy JR. Orthognathic treatment: how much does it cost? *The European Journal of Orthodontics*. 2006;28(6):520–528.