

Treatment time for surgical-orthodontic cases: a private versus public setting comparison

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Objective: To evaluate the duration of combined orthodontic and orthognathic surgical cases treated either in the public or private health system in Western Australia.

Methods: The clinical records of 100 patients from the Orthodontics Department from the University of Western Australia Dental School and 100 patients from a private orthodontic practice in Perth, Australia who received combined surgical-orthodontic treatment were retrospectively assessed. Three statistical models were applied to explore the associations between treatment time (total, pre-surgery and post-surgery), clinical setting and extractions.

Results: Total treatment time was shorter in the private setting: 18.8 months for non-extraction and 22.0 months for extraction cases, and longer in the public university setting: 24.5 months for non-extraction and 27.7 months for extraction cases. Pre-surgical treatment time was shorter in the private setting: 13.1 months for non-extraction and 17.1 months for extraction cases, and longer in the public university setting: 17.1 months for non-extraction and 21.1 months for extraction cases. Post-surgical treatment time was shorter in the private setting: 5.5 months and longer in the public university setting: 7.1 months.

Conclusion: In a Western Australian health system, the treatment duration of combined orthodontic and orthognathic surgery cases is longer in the public university setting than in private practice.

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Introduction

The primary driving factor and indication for seeking orthodontic treatment is an improvement of dentofacial aesthetics.^{1,2} In cases in which the severity of a malocclusion is beyond the scope of orthodontic treatment alone, or for which orthodontic treatment alone would fail to deliver an acceptable aesthetic result, a combined surgical-orthodontic approach may be considered.³⁻⁵ While surgical-orthodontic treatment has the potential to improve aesthetics and psychosocial wellbeing, the treatment process, by its nature, places a burden on the patient related to time, co-operation, discomfort and aggravation.^{5,6}

Kiyak and colleagues examined the psychological changes of 55 orthognathic surgical patients prior to

surgery until nine months post-surgery.⁷ It was found that satisfaction peaked at four months post-surgery and declined at the nine month stage. The decline was most marked in those who were still undergoing orthodontic treatment.^{7,8} This suggested that the time taken in orthodontic treatment may have an impact on the psychological wellbeing and satisfaction of the patient.

It has been suggested that there is great variability in the treatment management of surgical-orthodontic cases and that duration is clinician dependent.⁹ Proffit and Miguel, in a retrospective study, examined and compared the records of 346 patients; 57 patients treated in a Dental Faculty Practice, 96 patients treated in the Graduate Orthodontic Clinic and 193

treated in private practice, with respect to pre-surgical, post-surgical and total treatment time.¹⁰ The median total treatment time was 18 months, 24.5 months and 28 months, respectively, with a statistically significant difference between the three groups. The authors identified factors that might contribute to variations in the length of treatment time relative to the pre-surgical and post-surgical phases.¹⁰ A late decision to proceed with orthognathic surgery or delays while awaiting growth completion; communication between surgeon and orthodontists; and clinical decisions regarding appointment sequencing and treatment procedures may impact on the length of pre-surgical treatment time. The efficiency of the orthodontist in completing treatment and their confidence in the stability of the result were likely to impact upon the length of post-surgical treatment time.

Dowling and colleagues examined the treatment times for 315 patients; 71 patients treated at the University of Oslo and 244 patients treated externally and who underwent a combined orthodontic-orthognathic surgical plan and reported a median treatment time of 21.9 months.¹¹ The authors found that the two largest factors that affected treatment time were the experience of the orthodontist with surgical cases and whether the treatment plan involved extractions. The patients treated in the university clinic had a shorter pre-surgical treatment time and a longer post-surgical treatment time when compared with patients treated externally. In contrast to Proffit and Miguel, the median total treatment time was not significantly different between the university and external clinics. Luther and colleagues examined the pre-surgical treatment time in 65 combined orthodontic-orthognathic surgical cases treated in a hospital and university setting and reported a median length of pre-surgical treatment time of 17 months.¹² The patients were treated by three consultant orthodontists and one senior specialist registrar and, within the limitations of the study, only the orthodontist appeared to have any effect on the treatment duration.

One of the factors that may affect duration is whether treatment has been provided in the public or the private health system. The current evidence is inconclusive as Proffit and Miguel reported a shorter duration while Dowling and colleagues reported no difference.^{10,11} Therefore, the primary purpose of this study was to evaluate the treatment duration of combined orthodontic and orthognathic surgical

cases in the public in contrast with the private health system in Western Australia.

Materials and methods

Exemption from ethics review was granted by the University of Western Australia Human Ethics Committee RA/4/20/4912. The clinical records of 100 patients from the Orthodontics Department from the University of Western Australia Dental School and 100 patients from a private orthodontic practice in Perth, Western Australia who received combined surgical-orthodontic treatment were retrospectively assessed. The patients treated at the University from 2001–2016 were managed by orthodontic residents. The patients treated at the private orthodontic practice in Perth were treated between 2002 and 2018. All patients treated at the University were supervised by the same clinical staff member (MG); the same practitioner treating all patients in the private practice cohort. Of the 200 subjects, 13 were excluded due to incomplete records, resulting in 187 patients comprising 97 private patients and 90 public patients.

The following data were recorded for each patient: age at the commencement of treatment, gender, malocclusion, type of surgery, if extractions were performed, if expansion was performed, the type of expansion, date of treatment commencement, surgical date, and date of treatment completion.

The schedule of events surrounding the surgery was consistent in the public and private environment as the clinician collected pre-surgical records, established a two dimensional plan and defined an occlusal outcome on plaster models that was agreed to by the respective surgical and orthodontic consultants in a relatively timely manner. The plan was transferred to a three-dimensional plan either on articulated models or a virtual planning platform resulting in the preparation and delivery of surgical guides.

Statistics

Three models were fitted to explore the associations between treatment time (total, pre-surgery and post-surgery), clinical setting and extractions. Summary statistics including mean values, standard deviation, medians, minima and maxima are provided for continuous variables whilst counts and percentages (%) are provided for categorical variables.

Significance was set at the 5% level and data were analysed using the R environment software (RStudio, MA, USA) for statistical computing.

Results

Of the 187 patients in the study, the population demographics by gender revealed the majority were females: 73% in the private setting and 70% in the public university setting (Figure 1). According to skeletal classification, the majority of the individuals exhibited a Class II malocclusion: 68% in private and 68% in the public university setting (Figure 2). The mean and median age of patients treated in the private practice were seven years greater than in the public system (Mean: 27.8 years vs 20.6 years; Median 24.0 years vs 17.0 years). The private practice treated a greater proportion of those with no need for treatment in the transverse dimension compared to the public setting (Figure 3). Within the public environment, a greater percentage of patients received extractions as part of their pre-surgical orthodontic

management compared with the private setting: 39% vs 29% respectively (Figure 4).

Modelling showed that, on average, the total treatment time was 572 days in the private setting; with an additional 98 days if patients required extractions; and an additional 172 days for patients in the public hospital (Figure 5).

Modelling showed that, on average, the pre-surgical treatment time was 399 days in the private setting, with an additional 122 days for patients requiring extractions; and an additional 120 days for patients in the public hospital (Figure 6).

Modelling indicated that, on average, the post-surgical treatment time was 167 days in the private setting with an additional 49 days required for patients in the public hospital (Figure 7).

Discussion

The current evidence related to the impact of treatment setting on the duration of combined orthodontic and

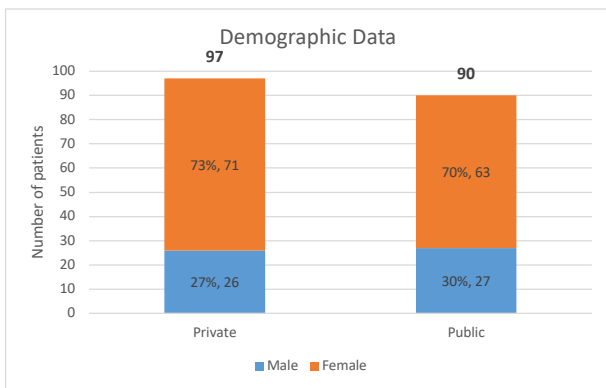


Figure 1. Demographic data.

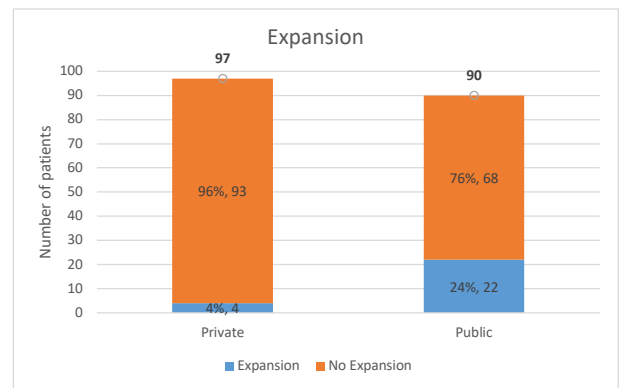


Figure 3. Treatment in the transverse dimension in private compared to public environment.

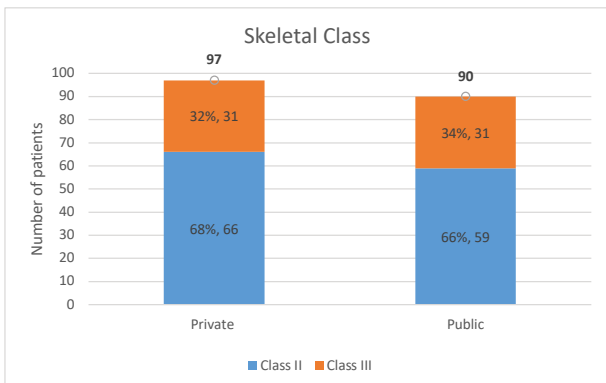


Figure 2. Surgical cases by skeletal Class in private compared to public environment.

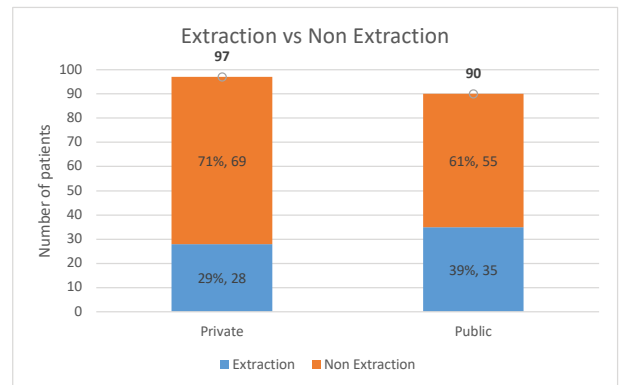


Figure 4. Extraction versus non-extraction in private compared to public environment.

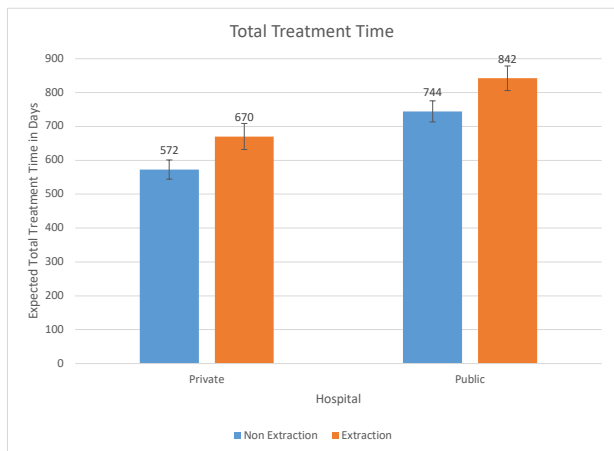


Figure 5. Total treatment time in private compared to public environment dependent on extraction or non-extraction treatment.

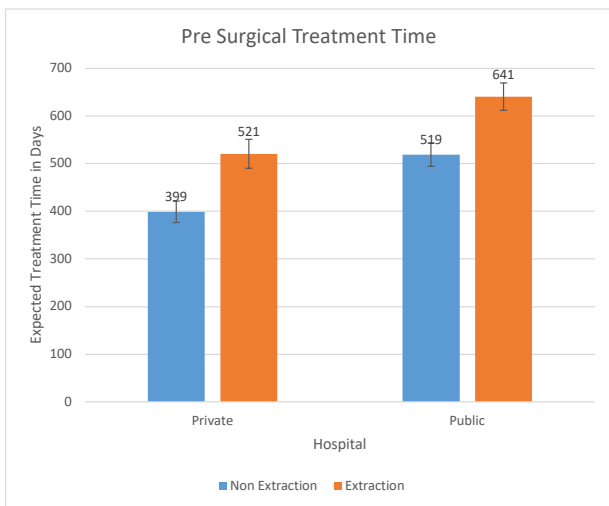


Figure 6. Pre-surgical treatment time in private compared to public environment dependent on extraction or non-extraction treatment.

orthognathic surgical cases is inconclusive. Not all global public systems are equal and the nuances of different systems may positively or negatively affect treatment duration. In the public system in the state of Western Australia, orthodontic services are provided in one facility and mainly by orthodontic residents supervised in a training program. In the present study, the operating clinician in the private setting was also the supervisor of the orthodontic residents who treated the cases in the public system, which minimised the bias created by different treatment approaches by multiple practitioners. The results demonstrate an increased treatment time in the public system reflected in both the pre-surgical and post-surgical treatment times. In the present study, total treatment time was shorter in the private setting: 18.8 months for non-extraction and 22.0 months for extraction cases, and

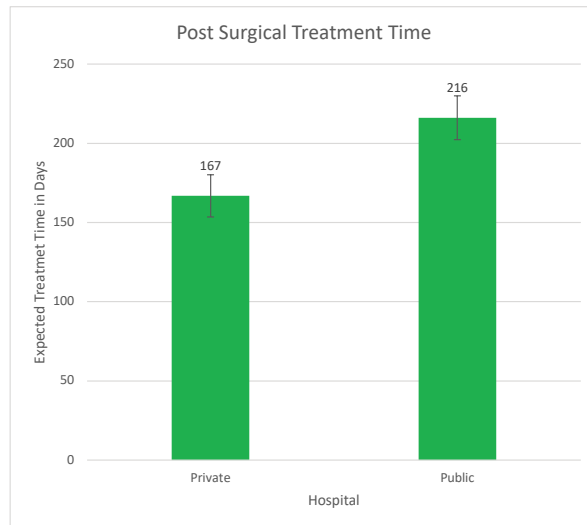


Figure 7. Post-surgical treatment time in private compared to public environment dependent on extraction or non-extraction treatment.

longer in the public university setting indicated by 24.5 months for non-extraction and 27.7 months for extraction cases. This is in contrast to Proffit and Miguel who reported shorter treatment times in the faculty practice setting and university clinic of 18 months and 24 months, respectively, and longer times in the private practice setting of 28 months, with the differences between the clinic settings all statistically significant ($p < 0.001$).¹⁰

Dowling and colleagues, in their study in Norway, had a median total treatment time of 21.9 months with a non-significant difference between those treated in the university setting and those treated externally of 21.2 versus 22.4 months, respectively.¹¹ A number of possible factors may play a role in unavoidable scheduling delays in the public system. These may be related to diminished bed availability during the winter flu season when elective surgical procedures are deferred to accommodate increased hospitalisation. There were no significant differences in scheduling of patients in the Christmas shutdown as the surgical department in both the public and private environment continued to actively function. Moreover, the academic calendar in the training environment did not include formal breaks in the schedule for examination preparation or vacations that may be assumed to delay treatment progress.

Pre-surgical treatment time in the present study was again shorter in the private setting: 13.1 months for non-extraction and 17.1 months for extraction cases, and longer in the public university setting: 17.1 months for non-extraction and 21.1 months for

extraction cases. However, a significant contribution to the pre-surgical delay in the public system remains the disruptions to availability of beds/personnel as dictated by medical circumstances. This was again in contrast to Proffit and Miguel, who had significantly shorter pre-surgical treatment times in the faculty practice setting of 11 months, compared with the similar treatment times in the university clinic and private practice setting of 15 and 17 months, respectively ($p < 0.001$).¹⁰

Dowling and colleagues reported a median pre-surgical treatment time of 15.4 months, which is similar to the present results in the private setting, being between the non-extraction and extraction cases of 13.1 months and 17.1 months, respectively.¹¹ Luther and colleagues, in a study involving patients treated at three UK institutions by three consultant orthodontists and one senior specialist registrar, reported a median pre-surgical treatment time of 17 months, which sits in between the results of the present study for values identified in a private versus public university setting.¹² While direct comparison is not possible due to the present study defining times based upon extraction criteria, the tendency for a longer pre-surgical treatment time in the public university setting is clear.

As expected, the need for extractions increased treatment time for private and public patients, which is consistent with existing literature and related to the time required to close extraction spaces prior to surgery.^{10,11} In the present study, 29% of private and 39% of public patients had extractions as part of their treatment. This was lower than the sample evaluated by Proffit and Miguel, with 67% of faculty practice, 57% of university clinic and 65% of private clinic patients requiring extractions.¹⁰

Dowling and colleagues found a statistically significant increase in pre-surgical (4.6 months) and total treatment time (4.4 months) when the treatment involved extractions, which occurred in 21% of their sample.¹¹ In contrast, Luther and colleagues found a minimal difference of 0.3 months in terms of pre-surgical treatment time when extractions were carried out.¹²

In a consideration of post-surgical treatment time, the results of the present study (5.5 months in private and 7.1 months in the public university setting) are comparable with those previously reported. Proffit and Miguel described a post-surgical treatment time of 7

months in the faculty and university setting, which is consistent with the present public university setting, and 9 months in the private clinic environment.¹⁰ Dowling and colleagues reported a median post-surgical treatment time of 5.9 months.¹¹

Various factors have likely contributed to the increase in treatment time in the public system, including: operator experience, surgical resource availability, operator transfer and finishing criteria. As treatment is carried out by residents in training, their lack of experience may result in increased treatment time. This may be due to imprecision in bracket placement as well as clinical decisions and achievement priorities related to arch decompensation and goal setting during the pre-surgical phase.¹⁰

The surgical resource availability in the public system is different to that in the private sector. Surgery is carried out by oral and maxillofacial surgical registrars in public hospitals and is therefore subject to delay due to operating theatre waiting lists and hospital bed availability. As an elective procedure, orthognathic surgery is often deferred if the operating theatre and hospital beds are required for urgent non-elective cases. Furthermore, as the surgical registrar is also in training, they will be required to prepare the surgical plan and seek consultant approval prior to arranging the surgery, which results in additional treatment time. As Proffit and Miguel identified, communication between the orthodontist and surgeon is critical during the pre-surgical treatment phase, and the ease with which these discussions can occur may impact treatment time.¹⁰ In the public system, this communication is more difficult as it involves both residents/registrars and their respective consultants.

The need to change operators during the course of treatment may also contribute to the additional treatment time in the public system. The duration of orthodontic training programs in Australia is three years and, depending on how far advanced residents' training might be when the case was started, surgical cases may often be seen by two operators. McGuinness and McDonald investigated the impact of operator changes on treatment times within a postgraduate orthodontic teaching environment.¹³ It was determined using the PAR Index that there was no difference in the quality of the treatment results; however, a significant difference in treatment time was found as a patient treated by more than one operator took an average of 26.1 months compared

with 17.67 months when treated by a single operator ($p < 0.001$). It is important to note that this study only examined two operators and excluded cases that had orthognathic surgery or cleft lip and palate. However, it is still reasonable to consider the findings relevant to orthodontic treatment involving orthognathic surgery.

Finishing and detailing of orthodontic cases is an important component of successful treatment and this is emphasised in a teaching environment. Students are preparing cases to demonstrate their clinical competency and skill in order to pass their final exams and graduate. These requirements may result in a longer time spent in treatment in order to detail the case to a standard ready for exam presentation. This is not always the case in a private practice setting, where patients have other priorities, often putting pressure on the clinician to complete treatment if they are satisfied with the results. This is occasionally a realistic issue in the private clinic environment. The results of the present study demonstrated similar post-surgical treatment times to those of previous studies. It is possible that the students spent the extra time in the pre-surgical phase to ensure the occlusion and the immediate post-surgical result was at a level that would require minimal finishing.

The decision to accept combined surgery and orthodontics in the private sector has been shown to be associated with factors related to adequate private health insurance.⁴⁻⁶ The present study did not assess the differences in motivational factors between the public and private patients, which could be the focus of future research.

Conclusions

In a Western Australian setting, the treatment duration of combined orthodontic and orthognathic surgery cases is longer in the public university setting than in private practice. This difference was most evident in the pre-surgical phase of treatment. Given the impact of the duration on orthodontic treatment on the psychological wellbeing of the patient, it is important to understand the factors that impact the treatment duration, particularly in combined surgical-orthodontic cases. This would allow the patient to be better prepared for expected treatment duration and

provide relevant government bodies with data for planning and allocation of funding and resources.

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Conflict of Interest

The authors declare no professional or financial conflict of interest in relation to this article.

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