

Original Research

Perception of orthodontic patients' & parents' towards different accelerated orthodontic procedures- A Questionnaire study

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ABSTRACT:

Introduction- Every year, there is an increasing number of adult patients seeking orthodontic treatment and a short treatment time has become a common demand among these patients. Optimum treatment in the shortest duration of time is a pre-requisite to successful orthodontic management. **Aim & objective** - The purpose of this study was to evaluate patients' & parents' perspective on orthodontic treatment duration & techniques for accelerating the rate of orthodontic tooth movement. **Materials & methods** - Adult patients' (n=50, >18yrs) and Parents' (n=50) of the minor patients' (10-18yrs) were personally surveyed regarding treatment duration & acceptance of procedures to enhance the speed of orthodontic treatment, and how much increase in fees they were willing to pay for these procedures. **Result-** Majority of the patients were very unwilling to undergo corticotomy, piezocision and micro-osteoperforation due to their invasiveness. 46% of the adult patients' & 50% of the parents' preferred low level laser therapy, whereas 38% of the adult patients' 30% of the parents' preferred drug injections. Chi square was used to compare the difference between the different responses. P value <0.05 was considered to be statistically significant. **Conclusion-** Invasiveness of the procedure was inversely related to its acceptability. Both the groups preferred non-invasive procedures over invasive procedures.

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INTRODUCTION

Patients' number one concern before starting orthodontic treatment is how long treatment will take. In the past two decades, new devices and modalities have made the orthodontic process more efficient, but not faster. Various attempts have been made to increase the rate of tooth movement while minimizing the associated side effects¹.

As per American association of orthodontists comprehensive orthodontic treatment usually ranges from 1-3 years, 21-27 months for non-extraction treatment & 25-35 months for extraction treatment. The ability to accelerate tooth movements would be advantageous for orthodontists because treatment duration has been linked to an increased risk of gingival inflammation, decalcification, dental caries and especially, root resorption. Longer treatment times are also expensive, both for the patient and the orthodontist. Shorter treatment durations are important

to all patients, especially for the adults, who are seeking treatment in increasing numbers.

Probably the best way to shorten treatment time is to speed up tooth movements². A number of procedures & techniques with the orthodontic treatment potential to reduce treatment times have been developed. Procedures aimed to reduce treatment duration fall into 3 major categories.

1. **Biologic** - local or systemic administration of drugs.
2. **Mechanical or physical stimulation** - vibration and low-energy lasers.
3. **Surgically facilitated Orthodontic treatment-** Dentoalveolar distraction, alveolar surgeries to undermine interseptal bone, and alveolar corticotomies³.

Despite of promising approaches, patients' & parents' perception of these procedures are unknown. In this questionnaire based study patients' & parents'

perceptions of each of these treatment procedures was evaluated. The specific procedures investigated consisted of invasive (corticotomies, piezocision, locally injected intraoral drugs, Micro-osteoperforation) and noninvasive (Low Level Laser therapy) methods.

AIM & OBJECTIVES

The purpose of this study was to evaluate patients' & parents' perspective on orthodontic treatment duration & techniques for accelerating the rate of orthodontic tooth movement.

MATERIALS & METHODS

Patients were divided into 2 groups

A. Adult patients' (n=50, >18yrs)

B. Parents' (n=50) of the minor patients' (10-18yrs)

Both the groups were personally surveyed regarding treatment duration & acceptance of procedures to enhance the speed of orthodontic treatment, and how much increase in fees they were willing to pay for these procedures.

ANNEXURE I

Questionnaire for adults

1. Your age _____

2. Sex _____

3. For how many years have you been in treatment?

1. <1 yr

2. 1-2 yrs 3. 2-3 yrs 4. >3 yrs

4. How strongly do you agree that treatment with braces takes too long?

1. Strongly agree

2. Somewhat agree

3. Somewhat disagree

4. Strongly disagree

5. How much more time have your orthodontist suggested for your treatment to get complete?

1. 6-12 months

2. 12-18 months 3. 18-24 months

3. >24 months

6. Please rate how willing you would be to undergo a one-time surgical procedure in addition to your braces to reduce treatment time (corticotomy). This procedure is minimally invasive and is similar to placing cuts in the bone (see information sheet).

1. Very willing

2. Somewhat willing

3. Somewhat unwilling

4. Very unwilling

7. Please rate how willing you would be to undergo a one-time procedure to place small incisions (cuts) on the gums to reduce the time you are in braces (piezocision).

1. Very willing

2. Somewhat willing

3. Somewhat unwilling

4. Very unwilling

8. Please rate how willing you would be to allow your orthodontist to inject medicine around your teeth to reduce the time you are in braces. (see information sheet).

1. Very willing

2. Somewhat willing

3. Somewhat unwilling

4. Very unwilling

INCLUSION CRITERIA

1. Patients' (>18yrs) & Parents' of the minor patients' (10-18yrs) currently in orthodontic treatment or initiating treatment soon.

2. Ability to read and understand English.

EXCLUSION CRITERIA

1. Patient less than 10 years of age.

2. Patients or parents of children with craniofacial deformities or medically handicapping conditions.

All patients and parents were asked about their willingness and interest in participating in this voluntary and anonymous questionnaire-based survey. Two close ended questionnaires (**Annexure 1**) were used to evaluate (1) adult patients' perception (2) parents' perceptions regarding treatment duration, appliances, and techniques available to accelerate orthodontic tooth movement. An information sheet that contained brief description of all clinical procedures was distributed among the parents & adult patients to ensure full understanding of the questions (**Annexure II**). The results for each question were based on the surveys that had a valid response.

9. Please rate how willing you would be to allow your orthodontist to use a low level lasertherapy to reduce the time you are in braces. (see information sheet).

1. Very willing
2. Somewhat willing
3. Somewhat unwilling
4. Very unwilling

10. Please rate how willing you would be to allow your orthodontist to insert mini-screw in the bone (Micro-osteoperforation) to reduce the time you are in braces. (see information sheet).

1. Very willing
2. Somewhat willing
3. Somewhat unwilling
4. Very unwilling

11. Please rank these additional orthodontic techniques or procedures in the order you prefer or feel convenient to undergo if advised to reduce the treatment time.

1. Corticotomy
2. Piezocision
3. Drugs injected around teeth
4. Low level laser therapy
5. Micro-osteoperforation

12. Does the cost of the treatment, high (low level laser therapy) & low (one timesurgical procedures) , would affect your decision ?

1. yes
2. No
3. Not sure
4. Neutral

Questionnaire for Parents

1. age _____

2. Is your son or daughter currently undergoing orthodontic treatment?

1. Son
2. Daughter

3. If yes, how many years in treatment?

1. <1 yr
2. 1-2 yrs
3. 2-3 yrs
4. >3 yrs

4. How strongly do you agree that orthodontic treatment takes too long?

1. Strongly agree
2. Somewhat agree
3. Somewhat disagree
4. Strongly disagree

5. How much more time have orthodontist suggested for your child's treatment to get complete?

1. <12 months
2. 12-18 months
3. 18-24 months
4. >24 months

6. Please rate how willing you would be to allow your child to undergo a one-time surgical procedure (corticotomy) in addition to the braces to reduce treatment time(read information sheet).

1. Very willing
2. Somewhat willing
3. Somewhat unwilling
4. Very unwillin

7. Please rate how willing you would be to allow your child to undergo a one-time procedure to place small cuts (piezocision) on the gums to reduce treatment time (read information sheet).

1. Very willing
2. Somewhat willing
3. Somewhat unwilling
4. Very unwilling

8. Please rate how willing you would be to allow locally injected medicine to reduce your child's treatment time (read information sheet).

1. Very willing

2. Somewhat willing
3. Somewhat unwilling
4. Very unwilling

9. Please rate how willing you would be to allow your orthodontist to use low level lasertherapy that will reduce your child’s treatment time(read information sheet).

1. Very willing
2. Somewhat willing
3. Somewhat unwilling
4. Very unwilling

10. Please rate how willing you would be to allow your orthodontist to insert mini-screw in the bone (Micro-osteoperforation) to reduce your child’s treatment time (read information sheet).

1. Very willing
2. Somewhat willing
3. Somewhat unwilling
4. Very unwilling

11. Please rank these additional orthodontic techniques or procedures in the order you prefer or feel convenient for your child to undergo if advised to reduce the treatment time.

1. Corticotomy
2. Piezocision
3. Drugs injected around teeth
4. Low level laser therapy
5. Micro-osteoperforation

12. Would you be able to pay higher monthly payments to reduce your child’s treatmenttime?

1. Very able
2. Somewhat able
3. Somewhat unable
4. Very unable


1. What percentage of increase in the orthodontic treatment fee would you be willing to pay for this additional treatment?


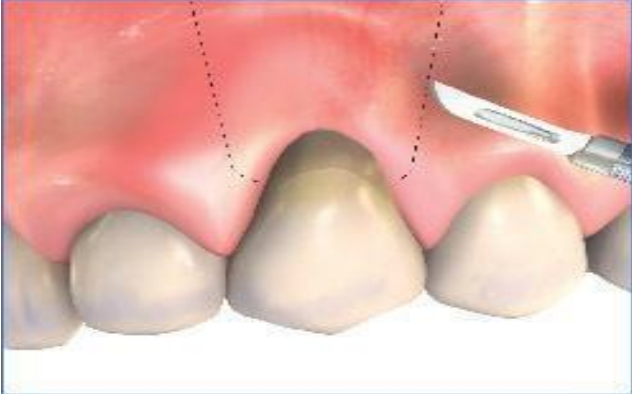
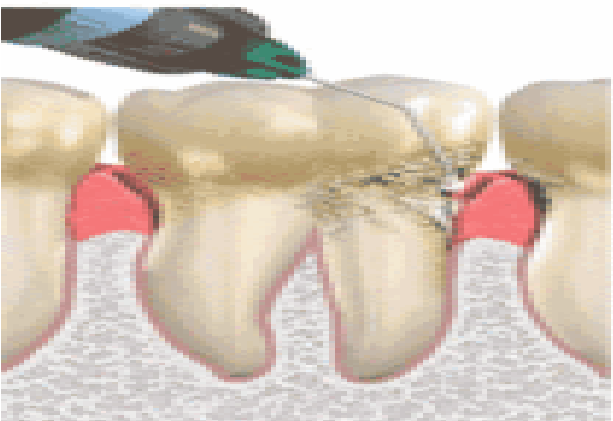

1. 10%
2. 20%
3. 30%
4. 40%
5. 50%


2. Does the cost of the treatment, high (low level laser therapy) & low (one time surgical procedures), would affect your decision?

1. Yes
2. No
3. Not sure
4. Neutral

ANNEXURE II - INFORMATION SHEET

| Procedure | Description | Photographs |
|---------------------------|---|--|
| <p>Corticotomy</p> | <p>Cuts are made on the bone surrounding the teeth after raising a gum flap (picture) to increase the rate of tooth movement.</p> |  |

| | | |
|--|---|--|
| | |  |
| <p>Piezocision</p> | <p>Instead of reflecting a flap, small micro-cuts are made through the gums to increase the rate of tooth movement.</p> |  |
| <p>Drug injected around teeth</p> | <p>Drugs injected around the teeth as shown in the picture.</p> |  |
| <p>Micro-Osteoperforation</p> | <p>Mini screw is inserted in the bone as shown in the picture</p> |  |

| | | |
|---------------------------------------|--|--|
| <p>Low Level Laser Therapy</p> | <p>Light source is directed around the teeth as shown in the picture</p> |  |
|---------------------------------------|--|--|

STATISTICAL ANALYSIS

Statistical analysis was carried out using statistical packages for SPSS 16.0 for Windows (SPSS Inc., Chicago, IL, USA). Simple descriptive statistics were used to summarize the data. Frequency distributions and percentages were used for categorical variables, and mean & standard deviation were used for continuous data. Chi square was used to compare statistical significant difference between the different responses to the questions of the questionnaire by the study subjects. P value <0.05 was considered to be statistically significant at 95% confidence interval.

RESULTS

A total of 100 orthodontic patients from chhattisgarh state population consented to participate in the survey. The demographic characteristics of the adult patients and the parents of the adolescent patients are summarized in (Table I, II, III) respectively. No patient was using any of these techniques described in the survey to decrease treatment time. A total of 50 adult patients (> 18 years) and parents of 50 adolescent patients (10-18 years) participated in the study (Table I, II, III). The majority of the patients responding to survey were females and had started orthodontic treatment (Table I, III).

42% of the adult patients & parents reported that they are undergoing orthodontic treatment since 1 year, when asked about how long they have been in treatment (Table IV,V).50% of the adult patients & 52% of the parents strongly agreed that orthodontic treatment is time taking (Table VI, VII). 22 adult patients reported that their orthodontic treatment will take another 6-12 months to get completed as suggested by their orthodontists, where as 21 parents reported that their orthodontist has given them the estimated time of 12- 18 months to finish the treatment(Fig 1,2.)

A set of questions captured the information on the perspective of adult patients & parents of different

treatment modalities that could reduce the treatment time. When all participants were surveyed regarding methods to reduce orthodontic treatment time, most were not aware of these techniques. An information sheet that contained brief description of all clinical procedures was distributed among the parents & adult patients to ensure full understanding of the questions(Annexure 2).

Among 100 responders to the questions regarding the acceptance of corticotomy & piezocision procedures as their treatment modality only 4% of the adult patients & 2% of the parents showed willingness towards corticotomy (Table VIII, IX,) same percentage of willingness was shown towards piezocision by the adult patients & parents (Table X,XI). Only 8% of adult patients & 2% of parents were ready to accept micro-osteoperforation as their treatment modality (Table XII, XIII). Majority of the patients were very unwilling to undergo these procedures due to their invasiveness.

When asked about the low level laser therapy and drug injections majority of the responders were willing to undergo these procedures as these procedures were less invasive.42% of the adult patients & 36% of the parents were very willing to undergo laser therapy (Table XIV, XV) whereas 34% of the adult patients were very willing to reduce their treatment time with drug injections & 48% of the parents opted for the option somewhat willing when asked about the drug injections (Table XVI, XVII)

Invasiveness of the procedure was inversely related to its acceptance. 46% of the adult patients' & 50% of the parents' preferred low level laser therapy, whereas 38% of the adult patients' 30% of the parents' preferred drug injections (Table XVIII, XIX). 54% of adult patients' & 56% of parents' showed that cost of the treatment would affect their decision (Table XX, XXI). 42% of the parents' were willing to pay only up to a 10% increase in fees for these approaches. (Table XXII).

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------|------------------|----------------|----------------------|---------------------------|
| Male | 21 | 42.0 | 42.0 | 42.0 |
| Female | 29 | 58.0 | 58.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table II- Gender of minor patients | | | | | |
|---|----------|------------------|----------------|----------------------|---------------------------|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Son | 23 | 46.0 | 46.0 | 46.0 |
| | Daughter | 27 | 54.0 | 54.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| Table III - Age of adult & minor patients | | | | | |
|--|----------|----------------|----------------|-------------|-----------------------|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| Age (Adults) | 50 | 19.00 | 40.00 | 23.9600 | 3.93291 |
| Age (Adolescents) | 50 | 10.00 | 18.00 | 14.4400 | 2.30492 |

| Table IV- Duration of treatment for adult patients | | | | | |
|---|-----------|------------------|----------------|----------------------|--------------------------|
| | | Frequency | Percent | Valid Percent | CumulativePercent |
| | <1 year | 21 | 42.0 | 42.0 | 42.0 |
| | 1-2 years | 17 | 34.0 | 34.0 | 76.0 |
| | 2-3years | 8 | 16.0 | 16.0 | 92.0 |
| | > 3 years | 4 | 8.0 | 8.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| Table V- Duration of treatment for minor patients | | | | | |
|--|-----------|------------------|----------------|----------------------|--------------------------|
| | | Frequency | Percent | Valid Percent | CumulativePercent |
| | < 1 year | 21 | 42.0 | 42.0 | 42.0 |
| | 1-2 years | 18 | 36.0 | 36.0 | 78.0 |
| | 2-3 years | 9 | 18.0 | 18.0 | 96.0 |
| | > 3 years | 2 | 4.0 | 4.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| Table VI | | | | | |
|---|-------------------|------------------|----------------|----------------------|---------------------------|
| How strongly do you agree that treatment with braces took long? (adult patients) | | | | | |
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| | Strongly agree | 25 | 50.0 | 50.0 | 50.0 |
| | Somewhat agree | 18 | 36.0 | 36.0 | 86.0 |
| | Somewhat disagree | 4 | 8.0 | 8.0 | 94.0 |
| | Strongly disagree | 3 | 6.0 | 6.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| Table VII | | | | | |
|--|-------------------|------------------|----------------|----------------------|--------------------------|
| How strongly do you agree that treatment with braces took long? (parents) | | | | | |
| | | Frequency | Percent | Valid Percent | CumulativePercent |
| | Strongly agree | 26 | 52.0 | 52.0 | 52.0 |
| | Somewhat agree | 18 | 36.0 | 36.0 | 88.0 |
| | Somewhat disagree | 6 | 12.0 | 12.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| Table VIII Corticotomy (adults) | | | | | |
|--|--------------------|------------------|----------------|----------------------|--------------------------|
| | | Frequency | Percent | Valid Percent | CumulativePercent |
| | Very willing | 2 | 4.0 | 4.0 | 4.0 |
| | Somewhat willing | 12 | 24.0 | 24.0 | 28.0 |
| | Somewhat unwilling | 13 | 26.0 | 26.0 | 54.0 |
| | Very unwilling | 23 | 46.0 | 46.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| Table IX Corticotomy (parents) | | | | | |
|---------------------------------------|--------------------|------------------|----------------|----------------------|---------------------------|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| | Very willing | 2 | 4.0 | 4.0 | 4.0 |
| | Somewhat willing | 17 | 34.0 | 34.0 | 38.0 |
| | Somewhat unwilling | 10 | 20.0 | 20.0 | 58.0 |

| | | | | |
|----------------|----|-------|-------|-------|
| Very unwilling | 21 | 42.0 | 42.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table X piezocision (adults) | | | | |
|------------------------------|-----------|---------|---------------|-------------------|
| | Frequency | Percent | Valid Percent | CumulativePercent |
| Very willing | 1 | 2.0 | 2.0 | 2.0 |
| Somewhat willing | 7 | 14.0 | 14.0 | 16.0 |
| Somewhat unwilling | 14 | 28.0 | 28.0 | 44.0 |
| Very unwilling | 28 | 56.0 | 56.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table XI Piezocision(parents) | | | | |
|-------------------------------|-----------|---------|---------------|-------------------|
| | Frequency | Percent | Valid Percent | CumulativePercent |
| Very willing | 1 | 2.0 | 2.0 | 2.0 |
| Somewhat willing | 9 | 18.0 | 18.0 | 20.0 |
| Somewhat unwilling | 21 | 42.0 | 42.0 | 62.0 |
| Very unwilling | 19 | 38.0 | 38.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table XII Micro-osteoperforation (adults) | | | | |
|---|-----------|---------|---------------|--------------------|
| | Frequency | Percent | Valid Percent | Cumulative Percent |
| Very willing | 4 | 8.0 | 8.0 | 8.0 |
| Somewhat willing | 14 | 28.0 | 28.0 | 36.0 |
| Somewhat unwilling | 9 | 18.0 | 18.0 | 54.0 |
| Very unwilling | 23 | 46.0 | 46.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table XIII Micro-osteoperforation (parents) | | | | |
|---|-----------|---------|---------------|-------------------|
| | Frequency | Percent | Valid Percent | CumulativePercent |
| Very willing | 1 | 2.0 | 2.0 | 2.0 |
| Somewhat willing | 6 | 12.0 | 12.0 | 14.0 |
| Somewhat unwilling | 17 | 34.0 | 34.0 | 48.0 |
| Very unwilling | 26 | 52.0 | 52.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table XIV LLLT(Adult patients) | | | | |
|--------------------------------|-----------|---------|---------------|-------------------|
| | Frequency | Percent | Valid Percent | CumulativePercent |
| Very willing | 21 | 42.0 | 42.0 | 42.0 |
| Somewhat willing | 16 | 32.0 | 32.0 | 74.0 |
| Somewhat unwilling | 2 | 4.0 | 4.0 | 78.0 |
| Very unwilling | 11 | 22.0 | 22.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table XV LLLT (parents) | | | | |
|-------------------------|-----------|---------|---------------|--------------------|
| | Frequency | Percent | Valid Percent | Cumulative Percent |
| Very willing | 18 | 36.0 | 36.0 | 36.0 |
| Somewhat willing | 22 | 44.0 | 44.0 | 80.0 |
| Somewhat unwilling | 5 | 10.0 | 10.0 | 90.0 |
| Very unwilling | 5 | 10.0 | 10.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| Table XVI Drug injection (Adult patients) | | | | |
|---|-----------|---------|---------------|-------------------|
| | Frequency | Percent | Valid Percent | CumulativePercent |
| Very willing | 17 | 34.0 | 34.0 | 34.0 |
| Somewhat willing | 18 | 36.0 | 36.0 | 70.0 |
| Somewhat unwilling | 3 | 6.0 | 6.0 | 76.0 |
| Very unwilling | 12 | 24.0 | 24.0 | 100.0 |
| Total | 50 | 100.0 | 100.0 | |

| | | Frequency | Percent | Valid Percent | CumulativePercent |
|--|--------------------|-----------|---------|---------------|-------------------|
| | Very willing | 6 | 12.0 | 12.0 | 12.0 |
| | Somewhat willing | 24 | 48.0 | 48.0 | 60.0 |
| | Somewhat unwilling | 12 | 24.0 | 24.0 | 84.0 |
| | Very unwilling | 8 | 16.0 | 16.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| | | Frequency | Percent | Valid Percent | CumulativePercent |
|------------------|---------------------------|-----------|---------|---------------|-------------------|
| First Preference | Drug injected aroundtooth | 19 | 38.0 | 43.2 | 43.2 |
| | Low level Lasertherapy | 23 | 46.0 | 52.3 | 95.5 |
| | Micro osteoperforation | 2 | 4.0 | 4.5 | 100.0 |
| | Total | 44 | 88.0 | 100.0 | |
| Missing | System | 6 | 12.0 | | |
| Total | | 50 | 100.0 | | |

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|--------------------|-----------|---------|---------------|--------------------|
| First Preference | Corticotomy | 2 | 4.0 | 4.8 | 4.8 |
| | jected aroundtooth | 15 | 30.0 | 35.7 | 40.5 |
| | level Lasertherapy | 25 | 50.0 | 59.5 | 100.0 |
| | Total | 42 | 84.0 | 100.0 | |
| Missing | System | 8 | 16.0 | | |
| Total | | 50 | 100.0 | | |

| | | Frequency | Percent | Valid Percent | CumulativePercent |
|--|----------|-----------|---------|---------------|-------------------|
| | Yes | 27 | 54.0 | 54.0 | 54.0 |
| | No | 9 | 18.0 | 18.0 | 72.0 |
| | Not sure | 8 | 16.0 | 16.0 | 88.0 |
| | Neutral | 6 | 12.0 | 12.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| | | Frequency | Percent | Valid Percent | CumulativePercent |
|--|----------|-----------|---------|---------------|-------------------|
| | Yes | 28 | 56.0 | 56.0 | 56.0 |
| | No | 8 | 16.0 | 16.0 | 72.0 |
| | Not sure | 9 | 18.0 | 18.0 | 90.0 |
| | Neutral | 5 | 10.0 | 10.0 | 100.0 |
| | Total | 50 | 100.0 | 100.0 | |

| Ability to pay higher | | What % of increase in orthodontic treatment fee | | | | | Total |
|-----------------------|---------------|---|-----|-----|-----|-----|-------|
| monthly payments | | 10% | 20% | 30% | 40% | 50% | |
| So | Very able | 0 | 0 | 7 | 2 | 2 | 11 |
| | Somewhat able | 12 | 8 | 1 | 0 | 0 | 21 |
| | mewhatunable | 9 | 0 | 0 | 0 | 0 | 9 |
| | Total | 21 | 8 | 8 | 2 | 2 | 41 |

| | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 |
|------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Chi-square | 14.800 ^a | 27.900 ^a | 22.800 ^a | 17.600 ^a | 16.700 ^a | 11.200 ^a | 15.700 ^a | 15.700 ^a | 16.900 ^b | 22.800 ^a |
| df | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |

| | | | | | | | | | | | |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| P value | .002* | .001* | .001* | .001* | .001* | .010* | .001* | .001* | .001* | .001* | .001* |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

| | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 |
|------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------|----------------|----------------|----------------|
| | 22. | 18. | 12. | 10. | 32. | 20. | 15. | 18. | 30. | 19 | 10. | 29. | 26. |
| | 84 | 00 | 16 | 00 | 40 | 72 | 60 | 64 | 16 | .0 | 48 | 36 | 32 |
| Chi-square | 0 ^a | 0 ^b | 0 ^a | 0 ^b | 0 ^b | 0 ^b | 0 ^b | 0 ^b | 0 ^b | 00 | 0 ^b | 6 ^d | 0 ^b |
| | | | | | | | | | | | | | |
| df | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 4 | 3 |
| P value | 1 | .001 | .002 | .019 | .001 | .001 | .001 | .001 | .001 | .001 | .015 | .001 | .001 |

Figure - 1

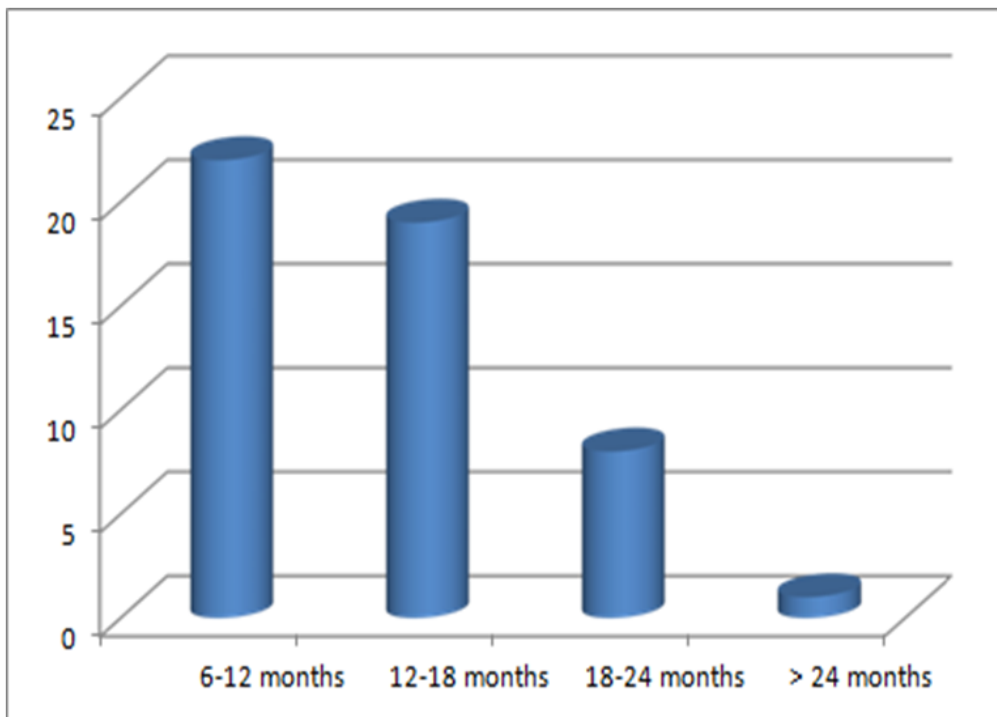
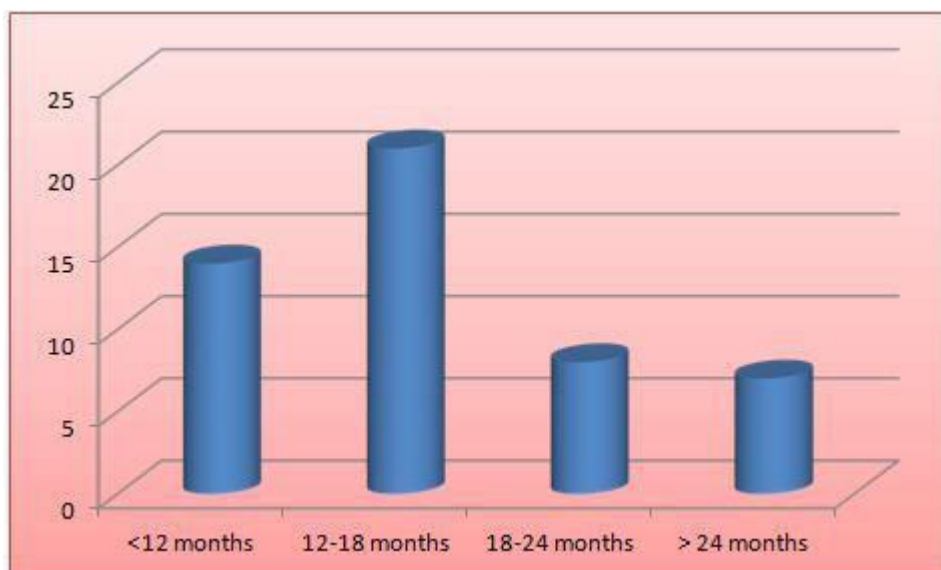


Figure - 2



DISCUSSION

Demand for orthodontic treatment is increasing amongst patients of all ages, including adults. Typically, a comprehensive orthodontic treatment requires two to three years of active tooth movement, which may not seem desirable for adults. Orthodontic appliances can impede proper oral hygiene and increase the risk of white spot lesions and caries. Other sequel of lengthy orthodontic treatment includes external apical root resorption, increased plaque index, increased level of dental caries and subsequent gingivitis, root resorption, gingival inflammation, and bone loss.

Reduction of treatment time may reduce the risk of the undesirable sequel and increase the acceptance rate of orthodontic treatment by adults. Some patients may be willing to pay more and undergo additional procedures in order to decrease treatment time and the side effects of orthodontic treatment. Both surgical modalities like osteotomy, corticotomy, distraction and non-surgical modalities like MOP, local injections of drugs have been used for increasing the tooth movement rate. However, some of these procedures need a referral to a periodontist or an oral surgeon to be performed, they may be lengthy and involve an invasive surgical procedure in addition to adding expenses to the comprehensive orthodontic treatment. Therefore, there is a growing interest among orthodontists in adopting adjunctive procedures to accelerate tooth movement that are considered “minimally-invasive” to accelerate tooth movement. The available evidence to date suggests that both Low Level Laser Therapy (LLLT) and Micro osteo-perforations (MOP) have the potential to be adopted in routine clinical practice with no additional distress for the patient.

The corticotomy technique dates back to 1983 and has been revised and modified over the years to eliminate the possible risks of the procedure. Corticotomy is defined as the surgical procedure that intentionally inflicts mechanical damage on the cortical bone. This increases bone remodelling to accelerate the repair and achieve functional recovery. The process takes place through recruiting osteoblasts and osteoclasts activated by local intercellular mediators. This creates a transitory state of osteoporosis, characterised by a reduction in bone density, which causes less resistance to tooth movement. This phenomenon was described by Harold Frost, who named it the Regional Acceleratory Phenomenon (RAP) ⁴

Piezocision is performed one week after the placement of orthodontic appliances (fixed or removable). A small vertical incision is made buccally and interproximally. This mid-level incision, between the roots of the teeth will allow for the insertion of the piezoelectric knife. The tip of the Piezotome is inserted in the gingival openings previously made and a 3 mm deep piezoelectrical corticotomy is done. The decortication has to pass the cortical layer and reach the medullary bone to get the full effect of the

regional acceleratory phenomenon (RAP). There is a localized surge in osteoclastic and osteoblastic activities which results, in the early phases, in a decrease in bone density with an increased bone turnover. This transient osteoporotic condition facilitates tooth movement⁵.

Among the non-invasive methods various physical devices & pharmacological agents have been proposed. Injection of vitamin D, prostaglandin E1 and 2 Osteocalcin, parathyroid hormone, long-term or high dose corticosteroids and thyroxin have shown positive effect on OTM.

Micro-osteoperforations (MOP) are minimally invasive and safe procedure. The controlled micro-trauma in the form of micro-osteoperforations given in the alveolar bone amplify the expression of inflammatory markers, leading to increase in the osteoclastic activity which in turn leads to the increase bone resorption and the tooth movement.⁶ MOP is a concept and technique developed by CTOR in 2010. Its effectiveness and efficiency in accelerating tooth movement were first proven by animal and human studies conducted by scientists and clinicians at CTOR. The technique/device was then patented by CTOR, and licensed to Propel Orthodontics⁷.

LLLT is a simple, non-invasive procedure in which a low amount of energy is given over the periodontal tissues to increase the rate of tooth movement⁸ Photobiostimulation or Biostimulation or Photobiomodulation depends upon the exposure of the tissue to therapeutic wavelengths of light, particularly in the near and far infrared ranges (600 to 1200 nm). This laser therapy is called as low level as it doesn't increase the temperature of surrounding tissues more than 1°C⁹. In the last decade, photobiostimulation by low level laser therapy (LLLT) have gained much attention in increasing the rate of tooth movement. Most of the studies have reported an increase in rate of canine retraction with different laser protocols^{10,11}. Orthodontic treatment takes approximately 2 years to complete. This amount of time appears to be too long for adult patients & the parents, 50% of the adult patients & 52% of the parents strongly agreed that the orthodontic treatment is time taking.

When the different procedures to enhance the rate of tooth movement were evaluated together, assuming all were able to reduce treatment time up to 25% to 30%, the preference for patients and parents was for less invasive, nonsurgical procedures such as Low level laser therapy & Drug injections. Furthermore, all groups were mostly unwilling to undergo corticotomies as a method to achieve this amount of reduction in treatment time. This is not surprising, because it has been shown that surgical procedures produce the highest anxiety in patients in a dental setting³

When the surgical procedures such as corticotomy and piezocision were evaluated separately, only 2-4% of parents & adults were very willing to undergo these procedures, however 34% of the adults & 18% parents

showed somewhat more willingness towards piezocision. Parents favoured piezocision and were slightly more amenable to allowing their children to have piezocision (approximately 18%). The same trend was observed in adult patients, who slightly preferred piezocision to corticotomies (approximately 34%). 8% of the adult patients were very willing to undergo micro-osteoperforation, adult patients preferred micro-osteoperforation to corticotomies, where as only 2% of the parents favoured MOP's which was similar to the willingness of corticotomy, parents considered MOP more invasive than the adult patients.

A minimally invasive procedure of injecting a drug approved by the Food and Drug Administration was better received by adult patients, parents: 34% & 12%, respectively, favoured drug injections, the acceptance rate was higher than invasive procedures. parents gave less preference to drug injection as they thought that injecting drug would have some side effects.

When non-invasive procedures such as LLLT was considered, acceptance was much higher. Adults & parents were very willing to undergo this procedure because of its non-invasiveness. 42% of adult patients & 36% of the parents favoured LLLT, which was highest among all the procedures.

Parents were somewhat able (42%) when asked whether they were able to pay higher monthly fees for reducing treatment time. However, regardless of the procedure or technique used to enhance the speed of tooth movement, approximately 42% were willing to pay only up to 10% more in orthodontic fees. 54% of adult patients & 56% parents reported that treatment cost would affect their decision in future.

Uribe et al³ evaluated patients', parents', and orthodontists' perspectives on orthodontic treatment duration and techniques for accelerating the rate of tooth movement. Adolescent patients (n = 200) and their parents (n = 200), and adult patients (n = 50) from a multidocor practice were personally surveyed regarding treatment duration and acceptance of appliances and techniques to enhance the speed of orthodontic treatment, and how much increase in fees they were willing to pay for these.

Approximately 70% of the orthodontists who replied to the survey were interested in adopting additional clinical procedures to reduce treatment time. The invasiveness of the procedure was inversely related to its acceptance in all groups surveyed. Patients' & parents' were willing to pay only up to a 20% increase in fees for these approaches. Orthodontists and patients alike are interested in techniques that can accelerate tooth movement. Similarities between all groups were found regarding the acceptance of different approaches to accelerate tooth movement and the percentage of the orthodontic fee that would be paid for these techniques. Less-invasive techniques had greater acceptability in all groups.

Zawawi et al¹² evaluated patients' acceptance of

corticotomy-assisted orthodontics as a treatment option. Adult patients seeking orthodontic treatment were asked to complete two sets of questionnaires; the first set included questions about age, sex, and level of education and general questions about orthodontic treatment; and the second set was related to the corticotomy-assisted orthodontics. Fear from the surgery (53.2%) was the most frequent reason for not selecting corticotomy followed by fear from pain (36.9%). The acceptance of corticotomy between males and females was similar. No relationship was found between the level of education and prior knowledge of the procedure, $P=0.857$. Prior knowledge about corticotomy was not a factor in selecting it as a treatment option ($P=0.556$) to reduce the treatment time ($P=0.427$).

This study provides a baseline for the current opinions of adolescents regarding treatment duration and new technology acceptance to reduce orthodontic treatment time. The current literature lacks sufficient data as to the efficiency & rate of acceleration of these procedures therefore, the questionnaires were not based on rates of acceleration.

This survey could be expanded to include perception of different socioeconomic statuses in different regions of the country. Also, other techniques for accelerating tooth movement could be added.

CONCLUSIONS

Adult patients & parents of minor patients did not favour invasive approaches such as corticotomies, piezocision & Micro-osteoperforation for reducing orthodontic treatment time. Invasiveness of the procedure was inversely related to its acceptability. Both the groups preferred non-invasive procedures over invasive procedures.

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