



# Does Socioeconomic Class and Educational Level of Orthodontic Patients have any Impact on their Satisfaction with Treatment duration, Perception and Attitude Towards Accelerated Orthodontics?

Chukwudi O. Onyeaso <sup>a++\*</sup>,  
Babatope Bamidele Osagbemiro <sup>b#</sup>, Chinyere Ututu <sup>c†</sup>,  
Emmanuel Chukwuma <sup>c†</sup>, Marian Orikpete <sup>c†</sup>,  
Benjamin O. Okino <sup>c‡</sup> and Chikamaram O. Okino <sup>d^</sup>

<sup>a</sup> Department of Orthodontics and Paediatric Dentistry, Faculty of Dentistry, College of Health Sciences, University of Port Harcourt / University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria.

<sup>b</sup> Department of Community Dentistry and Periodontology, Faculty of Dentistry, College of Health Sciences, University of Port Harcourt / University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria.

<sup>c</sup> Department of Orthodontics and Paediatric Dentistry, Dental Centre, University of Port Harcourt Teaching Hospital, Nigeria.

<sup>d</sup> Department of Oral Pathology and Oral Medicine, Dental Centre, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria.

## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

## Article Information

DOI: <https://doi.org/10.9734/ajmah/2024/v22i71053>

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/118774>

<sup>++</sup> Professor of Orthodontics / Consultant Orthodontist;

<sup>#</sup> Senior Lecturer / Consultant Periodontologist;

<sup>†</sup> Senior Registrar in Orthodontics;

<sup>‡</sup> Registrar in Orthodontics;

<sup>^</sup> Registrar in Oral Medicine;

\*Corresponding author: E-mail: [chukwudi.onyeaso@uniport.edu.ng](mailto:chukwudi.onyeaso@uniport.edu.ng);

## ABSTRACT

**Background:** There is growing attention globally on the satisfaction of orthodontic patients about the duration of orthodontic treatment, and the importance of accelerated orthodontics but more information is needed concerning factors that could influence the patients.

**Aim:** To investigate possible influence of socioeconomic factors on their satisfaction with duration of orthodontic treatment, as well as their perception and attitude towards accelerated orthodontics.

**Materials and Methods:** A 15-month clinic-based survey of all orthodontic patients at a Nigerian Teaching Hospital was carried out using a self-administered questionnaire that sought information on their satisfaction with the duration of conventional orthodontic treatment and their perception and attitude towards accelerated orthodontics. Using SPSS IBM Version 25, the data was analyzed and both descriptive, student's t-test and ANOVA statistics were used to test the hypotheses. The significance level was set at  $P < .05$ .

**Results:** Social class did not show any significant associations with satisfaction with duration of orthodontic treatment and most of the variables for perception and attitudes to accelerated orthodontics ( $P > .05$ ), except for only two. Generally, patients' educational level did not give any significant associations with either satisfaction with duration of orthodontic treatment or their perception and attitudes towards accelerated orthodontics ( $P > .05$ ).

**Conclusion and Recommendation:** Socioeconomic status of the patients neither significantly influenced their satisfaction with the duration of orthodontic treatment nor their perception and attitudes towards accelerated orthodontics. Further similar research would be worthwhile.

*Keywords:* Socioeconomic class; influence; orthodontic patients; satisfaction; perception, attitudes; accelerated orthodontics.

## 1. INTRODUCTION

According to Gandedkar et al [1], the potential to revolutionize orthodontic tooth movement (OTM) by accelerating tooth movement is undeniable. However, a cautious and evidence-based approach is paramount. Rigorous research into both the benefits and risks, coupled with the development of targeted and safe delivery systems, is essential before integrating invasive, non-invasive, and pharmacological agents into routine clinical practice. Only then can we unlock the true potential of accelerated orthodontics (AO) techniques for faster, yet safe, orthodontic treatment, ultimately benefiting patients seeking a streamlined journey.

Researchers have explored numerous methods for speeding up tooth movement such as the mechanical/physical modalities like the following non-invasive methods - resonance vibration, photobiomodulations (low-level laser therapy and light-emitting diodes), magnetic fields, platelet rich plasma (PRP) [2-23,24-27], and the invasive (surgery) methods [28-46] such as corticotomy, osteotomy, piezoincision, micro-osteoperforation (MOP), periodontally assisted osteogenic

orthodontics (PAOO), corticotomy assisted osteogenic orthodontic treatment (CAOOT) and dental distraction (dentoalveolar distraction osteogenesis). The non-mechanical /non physical (drugs) so far used include the calcium, vitamin D3, parathyroid, prostaglandins, corticosteroids, osteocalcin, cytokines and relaxin [47-50].

Some of the scope and need of accelerated orthodontics (AO) have been enumerated [1] such as that it minimizes the impact of treatment on lifestyle and improves patient satisfaction, reduces chair time for both patient and orthodontist, allowing for increased patient volume, expands the scope of orthodontic care to address more challenging clinical situations, providing orthodontists with more tools to achieve optimal results in less time, promotion of positive patient experiences and enhances overall satisfaction with orthodontic care. While appreciating this great future of AO, it is important to note that there are still challenges or gaps that more research activities would help to address in relation to investigating the long-term effects of different AO techniques on root morphology and function, developing

standardized protocols for applying AO techniques to minimize root resorption, exploring the potential of combined approaches with other treatment modalities to optimize tooth movement while minimizing potential risks, and conducting research on individual susceptibility to root resorption to develop personalized treatment strategies [1].

In addition to the aforementioned research gaps needing solution for maximum benefits from AO is more information on the factors that could influence the acceptance and usage of AO by orthodontic patients. Socioeconomic status is the position or standing of a person or group in a society as determined by a combination of social and economic factors that affect access to education and other resources crucial to an individual's upward mobility. Low socioeconomic status is linked to many health risks, including cardiovascular disease [51]. Meanwhile, there are limited related published data on this among orthodontic patients in the global orthodontics community generally and particularly in Africa [52-55].

Therefore, this study aimed at assessing the possible influence of socioeconomic status of the patients' on their satisfaction with the duration of conventional orthodontic treatment, their perception and attitude toward accelerated orthodontics. It was hypothesized that: (1) there would not be any statistically significant influence of their social class (occupation) and educational level on their satisfaction with the duration of conventional orthodontic treatment; and (2) there would not be any statistically significant influence of their social class (occupation) and educational level on their perception and attitude toward accelerated orthodontics.

## 2. MATERIALS AND METHODS

### 2.1 Study Design

A self-administered questionnaire survey of cross-sectional and prospective orthodontic patients in a Federal Teaching Hospital (Orthodontics Clinic of the University of Port Harcourt Teaching Hospital) in the Niger Delta Region of Nigeria was carried out.

### 2.2 Sampling / Data Collection

This clinic-based survey of orthodontic patients was carried out between March, 2023 and May, 2024. One hundred and twenty-five (117) patients -50(42.7%) males and 67(57.3%) females filled and returned the questionnaire.

### 2.3 Social Classification (Occupation) and Educational Level of Patients

The social classification of the subjects was based on the registrar general's social class [56] as previously reported by Onyeaso [57] (Appendix I). However, this was slightly modified in the present report by having the students as a third group. The educational level of the patients or their parents (for minors) was categorized into primary school certificate, secondary school certificate, first degree or postgraduate degree. Appendix II is the sample of the questionnaire used in the study.

**Weighting of the Responses by the Participants:** For satisfaction with the duration of conventional orthodontic treatment: Very satisfied received a score of 1, Very dissatisfied was allotted 5. For question 8 (Q8): 1= most willing, 5= least willing; For question 9 (Q9):1=0%-10%; 5=Greater than 40% For question 10 (Q10): 1 = Increase in fees by 10%, 5 =Increase in fees by 50%.

### 2.4 Null Hypotheses

**The following null hypotheses were generated and tested:**

**Ho1** - that there would not be any statistically significant association between the satisfaction of orthodontic patients with duration of orthodontic treatment and their social class (occupation).

**Ho2** - that there would not be any statistically significant association between their perception and attitude towards accelerated orthodontics and their social class (occupation).

**Ho3** - that there would not be any statistically significant association between their satisfaction with duration of orthodontic treatment and their educational level.

**Ho4** - that there would not be any statistically significant association between their perception and attitude towards accelerated orthodontics and their educational level.

### 2.5 Data Analysis

Using the SPSS version 25, the whole data was analysed descriptively, as well as using student's t-test and one-way ANOVA statistics to test the hypotheses. The significance level was set at  $P < .05$ .

## 3. RESULTS

Out of the 117 patients who were served the questionnaire during the study period, 20 (17.1%) had primary school certificates, 33

**Table 1. Statistical analysis of the satisfaction of the patients with duration of conventional orthodontic treatment using one-way ANOVA**

		Satisfied with duration of active orthodontic treatment		t-test	p-value
		Mean	(SD)		
Occupation	Middle class	2.31	(1.21)	1.841	0.163
	Working class	2.50	(1.24)		
	Student	1.94	(1.18)		
Academic Qualification	Primary school certificate	1.90	(1.21)	2.177	.095
	O' level	1.85	(1.09)		
	University Degree	2.46	(1.22)		
	Postgraduate Degree	1.94	(1.21)		

**Table 2. One-way ANOVA of the perception and attitude of the patients towards accelerated orthodontics with respect to their social class (occupation)**

	Occupation						F(ANOVA)	P-value
	Middle class		Working class		Student			
	Mean	(SD)	Mean	(SD)	Mean	(SD)		
<b>Q8</b>								
Use of some medication	2.46	(1.17)	3.00	(1.41)	3.07	(1.23)	2.958	.056
Administration of biological substance	2.57	(1.20)	2.75	(1.14)	3.13	(1.08)	3.054	.051
Direct light electric current	2.86	(1.09)	2.92	(1.00)	2.84	(1.06)	.025*	.975
Low level laser therapy	2.37	(.84)	2.17	(.94)	2.80	(.96)	4.039	.020*
Resonance vibration	3.15	(1.05)	3.27	(1.10)	3.12	(1.08)	.102	.903
Corticotomes	3.03	(1.07)	3.33	(.98)	3.31	(1.05)	.840	.434
Piezocision	3.06	(1.14)	3.42	(1.16)	3.40	(1.03)	1.187	.309
<b>Q9</b>								
Use of medication locally intraoral	3.48	(1.23)	3.18	(1.47)	4.47	(7.53)	.433	.650
Administration of biologic sub	3.30	(1.19)	3.33	(1.30)	2.94	(1.32)	1.132	.326
Direct light electric	3.24	(1.25)	2.42	(1.51)	2.97	(1.33)	1.733	.182
LLLT	3.36	(1.17)	3.00	(1.60)	3.03	(1.38)	.716	.491
Resonance vibration	3.10	(1.30)	2.82	(1.40)	2.83	(1.38)	.420	.658
Corticotomies	3.20	(1.40)	2.90	(1.66)	2.75	(1.38)	1.021	.364
Piezocision	3.17	(1.32)	2.55	(1.44)	2.73	(1.38)	1.312	.274
<b>Q10</b>								
Use of some medication locally intraoral	1.44	(.95)	2.10	(1.45)	1.58	(1.00)	1.568	.213
Administration of biological substance	1.34	(.79)	1.82	(.87)	2.37	(4.37)	.973	.382
Direct light electric current	1.69	(1.12)	1.91	(1.22)	1.64	(.89)	.325	.724
Low level laser therapy	1.97	(1.18)	1.40	(.70)	1.78	(1.08)	1.082	.343
Resonance vibration	1.97	(1.27)	1.70	(1.06)	1.86	(1.04)	.228	.797
Corticotomes	1.79	(1.11)	1.90	(1.52)	1.71	(1.07)	.133	.876
Piezocision	1.79	(1.18)	1.70	(1.49)	1.73	(1.03)	.041*	.960
Reduction in time	1.67	(1.15)	1.00	(.)	1.33	(.52)	.350	.716

\*statistically significant associations

**Table 3. One-way ANOVA of the perception and attitude of the patients towards accelerated orthodontics with respect to educational level**

	Academic Qualification								F(ANOVA)	P-value
	Primary school		O'level		University Degree		Postgraduate Degree			
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)		
<b>Q8</b>										
Use of some medication	3.20	(1.36)	2.94	(1.27)	2.63	(1.20)	3.06	(1.21)	1.190	.317
Administration of biological substance	3.05	(1.39)	2.91	(1.10)	2.74	(1.00)	3.28	(1.23)	1.069	.365
Direct light electric current	2.55	(1.28)	2.85	(1.03)	2.78	(.84)	3.39	(1.20)	2.246	.087
Low level laser therapy	2.55	(.94)	2.73	(.94)	2.67	(.97)	2.28	(.89)	1.005	.394
Resonance vibration	3.20	(1.28)	2.94	(1.03)	3.24	(1.00)	3.19	(1.05)	.562	.642
Corticotomes	3.25	(1.21)	3.03	(1.07)	3.43	(.95)	3.06	(1.06)	1.075	.363
Piezocision	3.47	(1.31)	3.09	(1.04)	3.50	(.95)	3.00	(1.15)	1.508	.217
<b>Q9</b>										
Use of medication locally intraoral	4.47	(6.82)	3.20	(1.21)	4.78	(7.83)	2.86	(1.51)	.662	.577
Administration of biologic sub	2.72	(1.60)	3.00	(1.02)	3.33	(1.26)	3.00	(1.36)	1.117	.346
Direct light electric	2.88	(1.45)	3.10	(1.27)	3.04	(1.28)	2.71	(1.59)	.326	.807
LLLT	3.12	(1.50)	2.97	(1.33)	3.27	(1.25)	3.07	(1.54)	.311	.817
Resonance vibration	2.25	(1.57)	3.07	(1.19)	2.95	(1.27)	3.21	(1.53)	1.695	.173
Corticotomies	2.25	(1.53)	2.90	(1.24)	3.05	(1.43)	3.23	(1.54)	1.531	.212
Piezocision	2.50	(1.55)	2.90	(1.30)	2.90	(1.32)	2.92	(1.55)	.385	.764
<b>Q10</b>										
Use of some medication locally intraoral	1.44	(1.04)	1.53	(.97)	1.76	(1.08)	1.36	(1.08)	.759	.520
Administration of biological substance	3.18	(7.71)	1.45	(.74)	2.07	(1.89)	1.33	(.49)	1.104	.351
Direct light electric current	1.56	(.73)	1.34	(.61)	1.93	(1.17)	1.77	(1.17)	2.223	.090
Low level laser therapy	1.75	(1.18)	1.60	(.93)	1.91	(1.11)	2.00	(1.22)	.635	.594
Resonance vibration	1.80	(1.32)	1.79	(1.07)	1.93	(1.07)	2.00	(1.21)	.162	.922
Corticotomes	1.73	(1.28)	1.48	(.91)	1.90	(1.14)	2.00	(1.35)	.961	.415
Piezocision	1.67	(1.29)	1.43	(.69)	1.90	(1.14)	2.08	(1.51)	1.403	.247
Reduction in time	1.00	(.00)	1.33	(.58)	1.75	(.96)	1.00	(.)	.576	.652

Q8: 1= most willing, 5= least willing; Q9:1=0%-10%, 5=Greater than 40%;Q10: 1 = Increase in fees by 10%, 5 =Increase in fees by 50%

(28.2%) were secondary school certificate holders, 46(39.6%) were university first degree holders and those with postgraduate degrees accounted for 18(15.4%).Thirty five (20.9%) belong to the middle class social, 12(10.3%) working class and 70(59.8%).Table 1 provides the test of the influence of social class and educational level on the satisfaction with conventional orthodontic treatment by the patients, which reveals that neither social class (occupation) nor educational level had any statistically significant association with their satisfaction with the conventional orthodontic treatment ( $P > .05$ ).

Table 2 provides the statistical analyses, with respect to their occupation, of the willingness of the patients to use any of the accelerated orthodontics procedures if 25% to 30% of treatment time would be gained, how much reduction in treatment time they would consider to undergo/give their children treatment using any accelerated orthodontics technique, and their preference for percentage increase in fee for a percentage reduction in treatment time, respectively.

Table 3 provides the statistical analyses with respect to their educational level of the willingness of the patients to use any of the accelerated orthodontics procedures, if 25% to 30% of treatment time would be gained, how much reduction in treatment time they would consider to undergo/give their children treatment using any accelerated orthodontics technique, and their preference for percentage increase in fee for a percentage reduction in treatment time, respectively.

#### 4. DISCUSSION

This study has shown that neither the social class (occupation) nor the educational level of the orthodontic patients had any significant association with their satisfaction with the duration of conventional orthodontic treatment. This means the acceptance of the first and third null hypotheses of this study. A related earlier study in Nigeria [54] showed that no statistically significant associations were found between the dentists' satisfaction with duration of orthodontic treatment and their age, gender and years of practice as dentists ( $P > .05$ ). Khaing et al [58] reported there was a correlation of treatment duration, awareness of tooth movement improvement, increased frequency of visiting to orthodontic clinic to patient's satisfaction during their treatment conditions ( $p < 0.05$ ). Laothong

and Cheng [59] reported that Taiwanese and Thai patients rejected treatment because of high treatment costs and long treatment periods, respectively. A significant association was observed between household income and Thai patients' motivation ( $p < 0.05$ ). In addition, household income and information resources were significantly associated with the factors affecting Taiwanese patients' motivation ( $p < 0.05$ ).

This Nigerian clinic-based study has equally revealed that significant associations were found only between social classes (occupation) of the patients with their willingness to have direct light current. The working class was found to be significantly the least willing. Also, the working class was found to be significantly associated with not preferring any treatment option with increase in fee up to 20%. This suggests that despite the expected gain in treatment time from accelerated orthodontics, generally there is no significant differences concerning perception and attitude towards accelerated orthodontics on the basis of the social classes (occupation). This means that the second hypothesis of this study is largely accepted.

Concerning educational level of the patients, no single significant association was seen with perception and attitude towards accelerated orthodontics, which suggests that their educational levels could not influence their perception and attitude towards accelerated orthodontics. Therefore, the fourth null hypothesis is also accepted. It is documented that ethnicity influences motivation to seek orthodontic care [59]. Naturally, it would have been expected that the middle class should perceive such treatment procedures differently from the working class because of different financial power knowing the potential that AO holds in shortening treatment time. However, because of the harsh economic climate in Nigeria where the true middle class is being quickly eroded, if not already completely eroded, could have contributed to this finding of no significant associations of social class and educational level with their perception and attitude towards accelerated orthodontics. It is important to note that orthodontic treatment is a relatively expensive dental care globally, and accelerated orthodontics would mean some obvious additional cost on the patients, which many Nigerians might find difficult to fund due to the soaring cost of living in the country.Khaing et al [58] reported that economic status was the main factor affecting Thai patients, whereas many

factors affected Taiwanese patients' decision to seek orthodontic treatment.

Another recent similar study from Nigeria reported that generally the dentists' demographics did not have significant influence on their perception of accelerated orthodontics, and further related studies are advocated [54].

**Strengths and Limitations of the Study:** In addition to being a clinic-based study in a referral hospital which provides a fair spread of orthodontic patients, the study is the first of such investigation from Africa. However, it must be noted that it was one-time survey that was conducted only once because of the intention to get information about their opinions, attitudes, and behaviours. Also, the survey did not give recognition to the varying malocclusion complexities necessitating different treatment durations.

## 5. CONCLUSION

- Social class (occupation) of the orthodontic patients did not show any significant associations with their satisfaction with duration of conventional orthodontic treatment.
- The social class of the patients generally did not have any significant associations with their perception and attitude towards accelerated orthodontics, except in only two variables.
- Generally, the educational level of the patients did not give any significant associations with their satisfaction with the duration of conventional orthodontic treatment, as well as their perception and attitude towards accelerated orthodontics.

## 6. RECOMMENDATION

Future related studies are encouraged to ensure evidence-based practice of orthodontics, especially accelerated orthodontics in developing economies of the world like Nigeria.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

## CONSENT

As per international standards or institutional standards, participants' gave their consent before participating in the study.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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**Appendix I: Registrar General’s Social Classes**

<b>Social Class</b>	<b>Description</b>	<b>Example</b>
I	Professional and top managerial occupations	Doctor, dentist, university lecturer
II	Intermediate occupations, minor professions middle and lower managers	Teacher, nurse, chiropodist, supermarket manager
III	Skilled occupations, manual and non-manual	Draftsman, clerk, policeman, plumber, toolmaker, coal miner
IV	Semi-skilled occupations	Gardener, storekeeper, postal carrier
V	Unskilled occupations	Labourer, kitchen worker, office cleaner

It is often simpler to divide people in 2 groups to make broad statements about social differences. Classes I, II, and III (non-manual) constitute middle class; Classes III (manual), IV, and V are working class

**APPENDIX II**

**QUESTIONNAIRE ON ACCELERATED ORTHODONTICS**

Please, we need your support by responding to the questions below. This is purely for academic and treatment planning purposes. Your responses will be confidentially handled. Please, provide honest responses as much as possible. Thank you and God bless.

**SECTION A** (Please, tick your choice out of any of the options)

- (1) Age ----- (2) Gender: Male /Female (3) Academic Qualification: (a) Primary School Certificate (b) O’ Level (WASCE/GCE) (c) University Degree (d) Postgraduate Degree (4) Type of Work/Job: -----  
----- (5) Estimate of Annual Income: -----  
(6) Marital Status: (a) Living with Spouse (b) Single Parent

**SECTION B**

- (7) Are you satisfied with the duration of active orthodontic treatment for yourself /child /ward?  
(a) Very satisfied (b) somewhat satisfied (c) neutral (d) somewhat dissatisfied (e) very dissatisfied  
(8) Any of the procedures below can help to accelerate the orthodontic treatment. As a parent or patient,  
which of these procedures would you prefer to use, if 25% to 30% of treatment time would be gained?

<b>Procedure</b>	<b>Most willing</b>	<b>Willing</b>	<b>Neutral</b>	<b>Not willing</b>	<b>Least willing</b>
Use of some medications injected locally intraoral:					
Administration of biological substance and hormones (local or systemic):					
Direct light electric current-electric current application of about 20 μA for 5 h daily:					

<b>Procedure</b>	<b>Most willing</b>	<b>Willing</b>	<b>Neutral</b>	<b>Not willing</b>	<b>Least willing</b>
Low level laser therapy (LLLT):					
Resonance vibration:					
Corticotomies:					
Piezocision:					

(9) How much reduction in treatment time would you consider to undergo/give your child treatment using any acceleration technique? Please, tick any of the options below:

<b>Technique</b>	<b>0% -10%</b>	<b>10%-20%</b>	<b>20%-30%</b>	<b>30%-40%</b>	<b>Greater than 40%</b>
Use of some medications injected locally intraoral:					
Administration of biological substance and hormones (local or systemic):					
Direct light electric current-electric current application of about 20 $\mu$ A for 5 h daily:					
Low level laser therapy (LLLT):					
Resonance vibration:					
Corticotomies:					
Piezocision:					

(10) If you were to use any of the acceleration techniques, indicate your preference for percentage increase in fee for a percentage reduction in treatment time (Tick only one option in each row)

<b>Increase in fees (%)</b>	<b>Increase in fees by 10%</b>	<b>Increase in fees by 20%</b>	<b>Increase in fees by 30%</b>	<b>Increase in fees by 40%</b>	<b>Increase in fees by 50%</b>
Use of some medications injected locally intraoral:					
Administration of biological substance and hormones (local or systemic):					
Direct light electric current-electric current application of about 20 $\mu$ A for 5 h daily:					

<b>Increase in fees (%)</b>	<b>Increase in fees by 10%</b>	<b>Increase in fees by 20%</b>	<b>Increase in fees by 30%</b>	<b>Increase in fees by 40%</b>	<b>Increase in fees by 50%</b>
Low level laser therapy (LLLT):					
Resonance Vibration:					
Corticotomies:					
Piezocision:					
<b>Reduction in time (%)</b>	<b>Reduction in time by 50%</b>	<b>Reduction in time by 40%</b>	<b>Reduction in time by 30%</b>	<b>Reduction in time by 20%</b>	<b>Reduction in time by 10%</b>

THE END We appreciate your kind participation in this study.

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The peer review history for this paper can be accessed here:  
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