Research Article

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To Assess Role of Digital Apps in Orthodontic Cephalometries

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ABSTRACT

Background: Lateral cephalometry is an essential diagnostic tool that orthodontists use to plan treatments, determine the results of a treatment, or predict growth. The present study was conducted to assess role of apps in orthodontic cephalometrics.

Materials & Methods: The present study was conducted on 30 orthodontics patients. All of the radiographs were taken using Kodak digital cephalometric machine. Digital radiographs were imported to the SmartCeph Pro app on an iPad Pro and traced with Apple Pencil.

Results: Age group 11-13 years had 8 males and 9 females and age group 13-15 years had 7 males and 6 females. Manual measurement SNA angle was 88.1, SNB was 86.9, ANB was 8.3, Max Mand Plane was 36.5, Ant Cranial Base was 68.1, Wits was 6.7, FMA 34.3, saddle was 130.6, Articular was 156.2, gonial was 140.2 and Sum of Angles was 392.1. On automatic software SNA angle was 88.2, SNB was 87.2, ANB was 8.2, Max Mand Plane was 36.4, Ant Cranial Base was 68.2, Wits was 6.5, FMA 34.3, saddle was 130.6, Articular was 156.1, gonial was 140.7 and Sum of Angles was 392.4. The difference was non- significant (P> 0.05).

Conclusion: Authors found that cephalometric analysis with digital apps was found to be equally effective as manual tracing.

Keywords: Cephalometric analysis, Digital apps Orthodontics.

INTRODUCTION

Lateral cephalometry is an essential diagnostic tool that orthodontists use to plan treatments, determine the results of a treatment, or predict growth.[1] Rapid advances in technology have led to broad applications in cephalometry, such as computer-aided cephalometric analyses, which have recently been introduced.[2] Many cephalometric computer programs have been developed that benefit image storage, the accuracy of assessments, data sharing, short-term growth prediction, and quick superimposition.[3]

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Cephalometric analysis is a tool for orthodontic diagnosis and treatment planning. Manual tracing is time consuming method for measuring linear and angular parameters of cephalograms. However, this method is still considered as a gold standard in cephalometric analysis. Due to the rapid progress in science and technology, the field of dentistry is constantly evolving.[4]

One of the applications of digital technology in orthodontics is the use computer programs for analyzing lateral cephalograms (computer-aided cephalometric analysis), which is aimed as a time saving alternative to manual tracing. Apps are specialized programs downloaded to mobile phones and tablet PCs. Recently, many dental and orthodontic apps have been developed.[5] The present study was conducted to assess role of apps in orthodontic cephalometrics.

MATERIALS & METHODS

The present study was conducted in the department of Orthodontics. It comprised of 30 orthodontics patients. The study was approved from institutional ethical committee.

Data such as name, age, gender etc. was recorded. All of the radiographs were taken using Kodak digital cephalometric machine. A total of 21 anatomical landmarks were defined on each radiograph, and 16 variables were calculated. All of these measurements were performed by the same investigator. Similarly, digital radiographs were imported to the SmartCeph Pro app on an iPad Pro and traced with Apple Pencil. Both manual and app tracing was performed. Results thus obtained were subjected to statistics. P value less than 0.05 was considered significant.

RESULTS

Table 1: Distribution of patients.

Age group (Years)	Male	Female
11-13	8	9
13-15	7	6

Table I, graph I shows that age group 11-13 years had 8 males and 9 females and age group 13-15 years had 7 males and 6 females.

Graph 1: Distribution of patients.

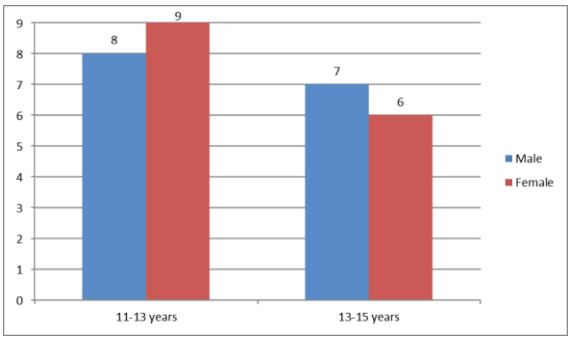
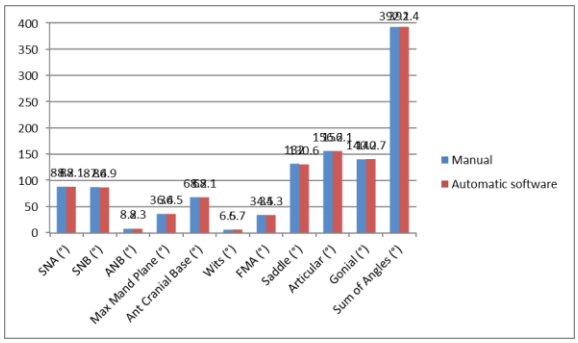


Table 2: Cephalometric measurements.

Skeletal measurements	Manual	Automatic software	P value
SNA (°)	88.2	88.1	0.91
SNB (°)	87.4	86.9	0.93
ANB (°)	8.2	8.3	0.12
Max Mand Plane (°)	36.4	36.5	0.76
Ant Cranial Base (°)	68.2	68.1	0.84
Wits (°)	6.5	6.7	0.23
FMA (°)	34.5	34.3	0.94
Saddle (°)	132.0	130.6	0.96
Articular (°)	156.2	156.1	0.72
Gonial (°)	140.2	140.7	0.16
Sum of Angles (°)	392.1	392.4	0.91

Table II, graph II shows that on manual measurement SNA angle was 88.1, SNB was 86.9, ANB was 8.3, Max Mand Plane was 36.5, Ant Cranial Base was 68.1, Wits was 6.7, FMA 34.3, saddle was 130.6, Articular was 156.2, gonial was 140.2 and Sum of Angles was 392.1. On automatic software SNA angle was 88.2, SNB was 87.2, ANB was 8.2, Max Mand Plane was 36.4, Ant Cranial Base was 68.2, Wits was 6.5, FMA 34.3, saddle was 130.6, Articular was 156.1, gonial was 140.7 and Sum of Angles was 392.4. The difference was non-significant (P> 0.05).

Graph 2 Cephalometric measurements.



DISCUSSION

Cephalometric analysis is a tool for orthodontic diagnosis and treatment planning. Manual tracing is time consuming method for measuring linear and angular parameters of cephalograms. However, this method is still considered as a gold standard in cephalometric analysis. Due to the rapid progress in science and technology, the field of dentistry is constantly evolving.[6] One of the applications of digital technology in orthodontics is the use computer programs for analyzing lateral cephalograms (computer-aided cephalometric analysis), which is aimed as a time saving alternative to manual tracing.[7] This approach uses manual identification of landmarks, based either on an overlaid tracing of a radiograph followed by the transfer of the tracing to a digitizer linked to a computer, or a direct digitization of the lateral skull radiograph using a direct digitizer linked to a computer, and then locating landmarks on the monitor.[8] The present study was conducted to assess role of apps in orthodontic cephalometrics.

In present study, age group 11-13 years had 8 males and 9 females and age group 13-15 years had 7 males and 6 females. Anuwongnukroh et al[9] in their study the lateral cephalograms of 108 orthodontic patients were selected. Eight linear (Pg-NB, Co-A, Co-Gn, U1-NA, L1-NB, Lower lip to E-plane, S-Go, and N-Me) and 9 angular (NS-Ba, SNA, SNB, NS-MP, FH-FO, U1-NA, L1-NB, L1-MP, and U1-L1) measurements were used in this study. The cephalometric analyses were performed by both manual method and automatic software. Analysis of inter-examiner calibration of the measurement revealed a high reliability. The result showed that there were statistically significant differences ($p<0.05$) in 13/17 parameters between the two methods, which consisted of 6 linear parameters (Pg-NB, Co-A, Co-Gn, U1-NA, L1-NB, and Lower lip to E-plane) and 7 angular parameters (SNA, NS-MP, FH-FO, U1-NA, L1-NB, L1-MP, and U1-L1). Only 4 parameters (NS-Ba, SNB, S-Go, and N-Me) did not show any significant differences. It is summarized that 76.47% (13/17 parameters) of cephalometric measurements performed automatically by the dental imaging software showed statistically significant differences when compared with the manual method.

We found that on manual measurement SNA angle was 88.1, SNB was 86.9, ANB was 8.3, Max Mand Plane was 36.5, Ant Cranial Base was 68.1, Wits was 6.7, FMA 34.3, saddle was 130.6, Articular was 156.2, gonial was 140.2 and Sum of Angles was 392.1. On automatic software SNA angle was 88.2, SNB was 87.2, ANB was 8.2, Max Mand Plane was 36.4, Ant Cranial Base was 68.2, Wits was 6.5, FMA 34.3, saddle was 130.6, Articular was 156.1, gonial was 140.7 and Sum of Angles was 392.4.

Aksakall et al[10] in their study twenty digital cephalometric radiographs were randomly selected from the archives and traced using the CephNinja app, SmartCeph Pro app, and Dolphin Imaging software. Twenty-one landmarks and 16 measurements were performed in each program. The statistical analysis was conducted using the Bland-Altman analysis at a significance level of 0.05. For the CephNinja app, there were seven measurements that were in accordance with Dolphin Imaging software. For the SmartCeph Pro app, six measurements were in accordance with Dolphin software. Both apps gave better results for angular measurements than linear ones.

CONCLUSION

Authors found that cephalometric analysis with digital apps was found to be equally effective as manual tracing.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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