AAO Annual Session

Sunday April 23rd 2017 : 10:45 am

Session : Cutting Edge Technology

Nikhilesh Vaid

Up in the Air:
Orthodontic Technology Unplugged
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editor in chief:
APOSTRENDS IN ORTHODONTICS

executive committee member:
WORLD FEDERATION OF ORTHODONTISTS

imm past president:
ASIAN PACIFIC ORTHODONTIC SOCIETY

ONLY ORTHODONTICS,
blue gardenia, peddar road,
mumbai-26, india
orthonik@gmail.com
Up in the Air: Orthodontic technology unplugged!
DEHUMANIZATION AT WORK
THE GOOD LIFE
SPEED & EFFICIENCY
will technology impact more than just the domain elements of orthodontics?
Up in the AIR

apps/appliances

imaging

rapid prototyping
Up in the AIR

technological infusions that have been game changers in orthodontics

applicances /apps

a number of apps on the android and ios platforms for management, diagnostics, communication and professional interactions.

appliances/adjuncts

* cad cam customized appliances
* aligners
* robotic arch-wires
* customized adjuncts through digital work-flows

imaging

* cbct’s
* facial 3D wl scans
* 3D photography
* intra oral scanning
* c models

volumetric data sets & integrated wraps

* softwares that integrate data and provide 3D volumetric data sets-great potential for research & planning in orthognathics.
* integrated volume wraps of various imaging modalities into a single file

rapid prototyping

applications in orthodontics-
* aligner fabrications
* surgical splints,
* bruxism splints
* auto transplantation templates
* customized appliances
* indirect bonding trays
* diagnostics for impacted teeth
* 3D printed jaws(orthognathics)
* cranofacial / cleft Planning
* 3D printed functional appliances
"Sorry, we can't e-mail your pizza as attachment."
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Log Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 Oct 69</td>
<td>22:30</td>
<td>Talked to SRC, Host to Host</td>
</tr>
</tbody>
</table>

Log-in:

- Log-in and behold

Apps

Internet
UP IN THE AIR

**MOBILE + INTERNET**

“lo and behold”

**UP IN THE AIR**

- **70%** of mobile searches result in an online action within an hour of the search being conducted.
- **Increasing website speed from 8 to 2 seconds can increase conversion rates by 74%**.
- **75.1%** of U.S.A. internet users access internet through a mobile device.

**“lo and behold”**

- **in 2015** mobiles influenced sales to the tune of **$1 Trillion**.
- **There are more mobile users (52.9%) worldwide than desktop users**.
- **50%** of mobile users abandon a site if it takes more than 10 seconds to load.
- **60% never return to the site**.
UP IN THE AIR
The World of Orthodontic apps.

Abstract

The usage of the portable electronic devices such as the smartphones and handheld tablets has increased over the years, and this is true in the health-care industry also. This is because of the development of various patient management softwares. The use of apps to manage, educate, and inform Patient is not uncommon among orthodontists nowadays. The aim of this article was to review the various apps available on the Google Play Store and iOS Apple Store for orthodontists and patients. Four smartphones using orthodontically relevant keywords such as orthodontics, orthodontists, and braces were searched and reviewed in detail. Out of the 354 orthodontically relevant apps available in both Android and Apple operating systems, the apps could be categorized as orthodontist-related apps or patient-related apps. Under these categories they could be further classified as practice management apps, patient education apps, model analysis apps, tooth material calculators, patient reminder apps, etc.

Key words: Orthodontic apps, orthodontics, smartphones, technology
orthodontic apps on the android and ios platforms for smartphones operating system

ios

clinicians apps

clinic apps/practice management 89
publications/journals/magazines 27
orthodontic products 10
apps aiding in diagnosis 8
orthodontic conferences 6
tooth ratio calculators 2
orthodontic news 2

patient apps

orthodontic education 26
reminding patients about elastic wear 3
reminding patients about aligner wear 2
dealing with orthodontic emergencies 2
progress tracker 2

android

clinicians apps

clinic apps/practice management 95
publications/journals/magazines 15
orthodontic products 7
apps aiding in diagnosis 10
orthodontic conferences 14
tooth ratio calculators 5
orthodontic news 2

patient apps

orthodontic education 18
reminding patients about elastic wear 2
reminding patients about aligner wear 2
dealing with orthodontic emergencies 1
progress tracker 4

total 179

TOTAL (in both operating systems) = 354

total 175
Does Text Messaging Reminder Help in the Orthodontic Compliance of Patients to Maintain their Oral Hygiene

Harshal Jejurikar*, Salil Nene, Ajit Kalia, Gaurav Gupta and Nasim Mirdeghani

Department of Orthodontics, M.A. Rangaswami College, Pune, India

Abstract

Objective: To determine if text messaging reminders regarding oral hygiene have any influence on the level of compliance with an orthodontic population.

Material & Method: 50 orthodontic patients were considered out of which 25 patients' parents were assigned text message group & 25 parents of patients were assigned in the non-text message group, which did not receive a reminder text message (control group). Message was sent once a week for 4 months. Oral hygiene compliance was measured using, plaque index (PI), and visual examination of white spot lesion (WSL). 1st appointment after two months (T1); 2nd appointment after three months (T2); 3rd appointments after four months (T3).

Results: The average plaque index is significantly higher in Control group compared to Text messaging group at 3 and 4 months post-messaging follow-ups while incidence of white spot lesions is significantly higher in control group compared to the text-messaging group at 3 months and 4 months post-messaging follow-ups.

Conclusion: A text message reminder system explaining the importance of oral hygiene sent to patients once weekly is an effective way to improve oral hygiene compliance in orthodontic patients.
DENTAL MONITORING
Connected orthodontics

PATIENT MOBILE APP
DENTAL MONITORING ANALYSIS CENTER
PRACTITIONER’S ONLINE DASHBOARD

Overbite: 2.44mm
Overjet: 2.94mm

Overbite: 0.14mm
Overjet: 2.15mm

Pick a date
SCALE: 10
RESET VIEW

VIEW DM ANALYSIS
NOTIFICATION CENTER

- ALERT
- INFORMATION
- WARNING
- GOAL ACHIEVED

EXAMPLES:

- POOR ORAL HYGIENE
- DEBONDED BRACKET
- UNSEATED ALIGNER
- BROKEN APPLIANCES
- DEBONDED BUTTON
- BROKEN ARCHWIRE

QUANTITATIVE ANALYSIS

Crown movements in degrees of tooth 21

EXAMPLES:

- Basal / Lingual Torque: 14.42° L
- Normal / Buccal Rotation: 8.77° D
- Normal / Basal Angulation: 8.38° B

SCALE: 📊 ⚙️ RESET VIEW: 🔄

UP IN THE AIR

Connected orthodontics

PATIENT NAME:

Emma Hariris
Fanny Rose
Anthony Bronson
Paul Robison
Gary Port
Isabel Amonti
Richard Bryant
Emily Dyer
Mike Pietro
Brandon Baguet
DM ACCURACY
INTERNAL 500 PATIENTS STUDY
0.05MM ON ANTERIOR SEGMENT
0.07MM ON POSTERIOR SEGMENT
appliances
not just brackets-not just wires!

* Cad cam customized vestibular/lingual appliances
* Aligners
* Robotic arch-wires

CUSTOMIZATION = EFFICACY
EFFICIENCY OUTCOMES
??????
Appliances

JD f/41

cad cam lingual appliance
Effectiveness and efficiency of a CAD/CAM orthodontic bracket system

Matthew W. Brown, Lorne Koroluk, Ching-Chang Ko, Kai Zhang, Mengqi Chen, and Tung Nguyen

Introduction: The first straight-wire appliance was introduced over 40 years ago to increase the consistency and efficiency of orthodontic treatment. More recently, computer-aided design and computer-aided manufacturing (CAD/CAM) technology has been used to create individualized orthodontic appliances. The purpose of this study was to investigate the clinical effectiveness and efficiency of CAD/CAM customized orthodontic appliances compared with direct and indirect bonded stock orthodontic brackets. Methods: This retrospective study included 3 treatment groups: group 1 patients were direct bonded with self-ligating appliances, group 2 patients were indirect bonded with self-ligating appliances, and group 3 patients were indirect bonded with CAD/CAM self-ligating appliances. Complete pretreatment and posttreatment records were obtained for all patients. The American Board of Orthodontics (ABO) Discrepancy Index was used to evaluate the treatment records, and the posttreatment outcomes were analyzed using the ABO Cast-Radiograph Evaluation. All data collection and analysis were completed by 1 evaluator. Results: There were no statistically significant differences in the ABO Discrepancy Index or the ABO Cast-Radiograph Evaluation among the groups. Treatment times for the 3 groups were significantly different; the CAD/CAM group was the shortest at $\pm 3.4$ months, compared with $21.9 \pm 5.0$ and $16.9 \pm 4.1$ months for the direct bonded and indirect bonded groups, respectively. The number of treatment appointments for the CAD/CAM group was significantly fewer for the direct bonded group. Conclusions: The CAD/CAM orthodontic bracket system evaluated in this study was as effective in treatment outcome measures as were standard brackets bonded both directly and indirectly. The CAD/CAM appliance was more efficient in regard to treatment duration, although the decrease in total archwire appointments was minimal. Further investigation is needed to better quantify the clinical benefits of CAD/CAM orthodontic appliances. (Am J Orthod Dentofacial Orthop 2015;148:1067-74)
Accuracy in tooth positioning with a fully customized lingual orthodontic appliance

Introduction: To understand orthodontic tooth movement, a method of measuring discrepancies in 3 dimensions is needed. Brackets and wires now can be fabricated to very precise tolerances and made at the beginning of treatment, so that treatment should produce the tooth movement that was planned at the initial setup. The extent of discrepancies between the planned and actual tooth movement can be determined from the examination of the setup and final models. The goal of this study was to evaluate the accuracy of orthodontic techniques using a digital measurement system.

Methods: Dental casts of 94 consecutive patients presenting with a variety of orthodontic problems, were scanned to create digital models, and each patient was registered individually for the maxillary and mandibular casts prior to treatment. Discrepancies between the setup and actual outcome were computed and expressed as deviations along the x, y, and z axes computed in a 59-dimensional rectangular coordinate system. Results: Discrepancies in positional deviations and outcome were small for all teeth (generally less than 1 mm and 4°). Some larger discrepancies were observed. Facio-lingual expansion in the initial setup was smaller than in the final models, especially at the second molars. Linear mixed models, initial crowding, time in slot-filling wire, use of elastics, days in treatment, interproximal reduction, and rebonding, were all influences on the final differences, but, for most of these factors, the influence was small, explaining only a small amount of the discrepancy between the planned and the actual outcomes.

Conclusion: These fully customized lingual orthodontic appliances were accurate in achieving the goals planned at the initial setup, except for the full amount of planned expansion and the inclination at the second molars. This methodology is the first step toward understanding and measuring tooth movement in 3 dimensions. (Am J Orthod Dentofacial Orthop 2011;140:433-43)

Dan Grauer and William R. Proffit
Chapel Hill, NC
Appliances
CAD CAM APPLIANCE SYSTEMS

vestibular

lingual

mirrored bracket

aligners

problem with mirroring?
CAD CAM APPLIANCE SYSTEMS

lingual

digital technology for the management of impacted canines in lingual orthodontics
shetty p, jain m and deshpande t - jco 2016 (l-11)

integrating cbct dicom data into virtual set up
-efficient & effective?
appliances
CAD CAM APPLIANCE SYSTEMS

vestibular lingual aligners

advanced aligner orthodontics
ojima kenji -apos trends ortho
vol 7(2) march 2017
Aligner therapy today:
difficulty with extrusions, root movement & severe rotations attachments!
Marketing over the top
Pictures do not add up to publication records
Digital workflows in contemporary orthodontics

Lars R. Christensen\textsuperscript{1,2,3}

\textsuperscript{1}Honorary Clinical Lecturer, Department of Orthodontics, UCL Eastman Dental Institute, London, UK, \textsuperscript{2}Visiting Professor, Department of Orthodontics, ITS Dental College, Hospital and Research Center, Greater Noida, Uttar Pradesh, India, \textsuperscript{3}Active Member, Edward H. Angle Society, Southern California Component, CA, USA
adjuncts

customized bonded retainers

lab- stefano@ortodonziaestense.it
Adjuncts

mini-implant supported devices/expanders

3 shape - appliance designer / implant studio

lab- stefano@ortodonziaestense.it
customized digital twin blocks

DVM f/10.5
customized digital twin blocks
UP IN THE AIR

selfie Lisa

WAIT A MINUTE

I NEED TO POST THIS
Imaging state of the art in orthodontics today...

- face
- facial skeleton
- intra-oral
i m a g i n g  f a c e
3 d photographs

http://www.canfieldsci.com/imaging-systems/vectra-hr-3d-imaging-system/
since its introduction into dentistry in 1998, CBCT has become an increasingly important source of 3D volumetric information in clinical orthodontics.
Imaging the dentition
To be honest, I am not yet ready to mothball our cameras. For starters, I still think that facial 2D photos are necessary. I know that there are 3D cameras available that will someday eliminate the need for our extraoral series of facial photos. However, for whatever reason (I believe primarily cost) these have not yet caught on. So for now we will still be taking a series of three 2D digital photos of our patients’ faces.
We have not yet found the best way to display and share the captured 3D dental images (STL files) to educate our patients. I anticipate that this last hurdle will be overcome in 2017 and when that happens our DSLRs are going to see much less action and our intra oral scanners are going to play an even larger role in our new patient process.
Accuracy of 3D Facial Models Obtained from CBCT Volume Wrapping

PRATIK PREMJANI, BDS, MSC
ANAS HASAN AL-MULLA, BDS, MSC, PhD
DONALD J. FERGUSON, DMD, MSD

Considerable research has been focused on creating a precise replica of the head. As imaging technology has advanced, the importance of facial analysis has increased, placing even more emphasis on realistic evaluation in diagnostics. The volume-wrapped 3D facial model (2D photos wrapped on CBCTs) appears to be a fast and easy way to obtain accurate facial dimensions without having to measure directly on the face. 13/14 measurements reliable, columnaellar length?
current project:
evaluation & accuracy comparison of digital facial models obtained by -
1) three extra oral 2d images volume wrapped on cbct’s
2) 3d scans with a structured light hand held scanner (artec eva)
3) 3d scans (artec eva) as it is (without volume wrapping)
control:
direct anthropometric measurements

Vaid Nikhilesh, Pratik Premjani, Soghyia Al-Mulla, Dhaval Fadia & Donald Ferguson
material & methods:
- 25 consecutive patients reporting to the orthodontic old, requiring cbct for diagnostics
- 16 female and 11 male subjects (mean age 20.4)
- cbct scans made at vs dental college & hospital, bangalore (kodak)
- irb obtained at euc, dubai, uae

acknowledgement: prof santosh ramegowda, vsdc, bangalore, india
along with the cbct scan...

- extra oral 2d photos (frontal, left & right profile) were made by a single operator (nikon d90-18-55 lens) - 3m
- direct anthropometric measurements with a sliding caliber (accuracy of 0.01mm) were made - reliability was tested (inter and intra observer at a 2 week interval. mean of 4 values considered)
- 3d structured blue light scan with a hand held scanner (artec-eva) was carried out by a single operator in controlled conditions
- volume wrapping by anatomage (san jose, california)
- as-it-is scans evaluated on artel studio (luxemborg)
- digital measurements were also checked for inter and intra operator reliability (4 values)
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material & methods:

GROUP A - direct anthropometric measurements
GROUP B - 2D images volume wrapped on a cbct (anatomage, california, usa)

material & methods:

UP IN THE AIR
GROUP C - 3D artec eva scans volume wrapped on a cbct (anatomage, california, usa)
imaging

material & methods:

GROUP D - 3D artec eva scans as it is - no volume wrapping-
(artec studio, luxemborg)
material & methods:

**Imaging**

Exposure time: 0.0005 sec, data acquisition: 16 frames/sec, blue LED light.

The Artec Eva Canner - 50 micron efficacy
## Imaging

**LANDMARKS EVALUATED**

Material & methods:

<table>
<thead>
<tr>
<th>Measurements Made</th>
<th>Points Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Endocanthion –</td>
<td>intercanthal distance</td>
</tr>
<tr>
<td>2) Exocanthion –</td>
<td>lateral canthal width</td>
</tr>
<tr>
<td>3) Exocanthion - Endocanthion –</td>
<td>right eye fissure width</td>
</tr>
<tr>
<td>4) Alare - Alare –</td>
<td>nasal width</td>
</tr>
<tr>
<td>5) Subnasale - pronasale –</td>
<td>nasal tip protrusion</td>
</tr>
<tr>
<td>6) Subnasale - highest point of columella –</td>
<td>columellar length</td>
</tr>
<tr>
<td>7) Subnasale - stomion –</td>
<td>overall upper labial height</td>
</tr>
<tr>
<td>8) Stomion – Superior lower lip –</td>
<td>lower lip height</td>
</tr>
<tr>
<td>8) Crista philtri superior –</td>
<td>upper prolabial width</td>
</tr>
<tr>
<td>9) Crusta philtri , inferior –</td>
<td>lower prolabial width</td>
</tr>
<tr>
<td>10) Alar curvature, crista philtri inferior –</td>
<td>facial insertion of alar base to inferior</td>
</tr>
<tr>
<td>11) Subnasale, crista philtri inferior -</td>
<td>midpoint of columella base to inferior of philtral column</td>
</tr>
<tr>
<td>12) Subalare, crista philtri inferior –</td>
<td>labial insertion of alar base to inferior point of philtral column</td>
</tr>
<tr>
<td>13) Crista philtri inferior, chelion –</td>
<td>inferior point of column to labial fissure</td>
</tr>
<tr>
<td>14) Crista philtri superior, crista philtri inferior –</td>
<td>philtrum length</td>
</tr>
<tr>
<td>15) Trichion – Glabella –</td>
<td>forehead height</td>
</tr>
<tr>
<td>16) Nasion – Gnathion –</td>
<td>face height</td>
</tr>
<tr>
<td>17) Nasion – Stomion –</td>
<td>upper face height</td>
</tr>
<tr>
<td>18) Subnasale – Gonion –</td>
<td>lower face height</td>
</tr>
<tr>
<td>19) Zygomatic – Zygomatic –</td>
<td>facial width</td>
</tr>
<tr>
<td>20) Nasion – Subnasale -</td>
<td>nose height</td>
</tr>
<tr>
<td>21) Subnasale – Subnasale –</td>
<td>columella width</td>
</tr>
<tr>
<td>22) Chelion – Chelion –</td>
<td>mouth width</td>
</tr>
<tr>
<td>23) Preaurale – Postaurale -</td>
<td>right ear width</td>
</tr>
<tr>
<td>24) Superioraurale – Subaurale</td>
<td>right ear length</td>
</tr>
<tr>
<td>25) Sellion-Subnasale</td>
<td>nasal height</td>
</tr>
</tbody>
</table>
the virtual patient:
- 3d scans/2d image wrap
- cbct
- intra oral scan

* with or without wrap
* integration across softwares
* time/cost benefit ratio
the paradigm shift in treatment philosophies also means that many clinicians have started to plan from the external profile
-3D facial photographic imaging was introduced to orthodontics during the early years of the millennium.

quantitative analysis of 3-dimensional facial soft tissue photographic images: technical methods and clinical application
Vikrum Nanda, Boris Gutman, Ehab Bar, Suha Alghamdi, Sotirios Tetradis, Aldons J Lusis, Eleazar Eskin and Won Moon
Progress in Orthodontics 2015, DOI: 10.1186/2402-6095-0082-0 © Nanda et al. 2015 Published: 2 July 2015

1. overlay of facial soft tissue maintaining color and texture data on corresponding CBCT data
2. generate functions to allow comprehensive averaging of multiple skulls with their facial soft tissue
3. create accurate methods to quantify and demonstrate differences in the craniofacial complex of an individual compared to a norm.
4. creating the most accurate virtual patient.
the direct technique for measuring extra oral facial anthropometric parameters is the “gold standard”
in this study, direct technique values were significantly smaller than the other three techniques in 6/25 (24%) measurements at the 99% probability level.
most significant differences were in regions not affected by routine orthodontics
compared to the direct technique, 2D volume wrap on CBCT values were closer than the values obtained from the 3D volume wrap and 3D CBCT techniques in those parameters.
differences in values between direct and other techniques were not clinically significant;
the largest significant difference was 0.71 mm for upper face height.
2D wraps, and 3D artec scans are methods that can be explored for facial analysis.
Wow, I think you went too far with the plastic surgery!
Rapid prototyping uses in orthodontics? Early 2000’s this decade - in office printer or not?
Rapid prototyping as a tool for diagnosis and treatment planning for maxillary canine impaction

Jorge Faber, Patrícia Medeiros Berto, Marcelo Quaresma


Published in issue: April 2006

Preview | Full-Text HTML | PDF | Supplemental Materials

Rapid prototyping: A new method of preparing trays for indirect
Rapid prototyping orthodontic applications

3D printed surgical splints

vandekar meghna & mokal nitin
Rapid prototyping
orthodontic applications

bending & customizing distractors
rapid prototyping

UP IN THE AIR

orthodontic applications

Rapid Prototyping as an Adjunct for Autotransplantation of Impacted Teeth in the Esthetic Zone

MEDHNA VANDEKAR, BDS
DHARAV, PANDYA, BDS
NAVEEN R. VAD, BDS
VIVAD DOSHI, BDS

A

Autotransplantation of teeth, introduced by Sipos and Ecsedi more than 40 years ago, is a proven option either for substitution of missing teeth or for replacement of avulsed and traumatized teeth when the original donor teeth are available. In cases of severely impacted teeth, it may avoid the need for complex traction clearance and the risk of side effects on adjacent teeth while reducing overall treatment time. The procedure requires visible periodontal ligament and cells around the tooth to be transplanted. It is an additional alternative, necessitating proper preparation of the recipient site, in the exact size and shape of the donor tooth root, to maintain the time the donor teeth remains outside the oral cavity during surgery.

Rapid prototyping of impacted donor teeth can be a useful adjunct to autotransplantation in some cases. A three-dimensional replica of the impacted tooth is printed by stereolithography.

autotransplantation templates
Rapid prototyping
orthodontic applications
from diagnostics to therapy
...the applications are endless!
Rapid prototyping

current project:
quantifying the role of rapid prototyped models (extracted from cbct dicom data) in diagnosis and treatment planning of impacted maxillary cuspids.

statement of the problem:
3D data being viewed on 2D screens - does actual 3D visualisation matter?

faber jorge, simina de melo lucas, lyra aline, flores-mir carlos, darendeliler ali, vaid nikhilesh
rapid prototyping

aim & objectives:

to compare and quantify orthodontist assessment of - severity of impacted maxillary cuspids, - traction favourability, - confidence to treat the same, as well as - time taken to assess the condition after studying conventional cbct slices printed on paper and rapid prototyped models derived from dicom files.
**Rapid prototyping**

**Materials & Methods:**

- The study was approved by the IRB—University de Sagrado Coração and due consent was obtained from participating patients (incl full facial photos).

**Samples:**

- The cross-sectional study involved 40 orthodontists from India & UAE divided in 2 groups.
- Orthodontists answered a questionnaire aiming to understand how orthodontic records...
  (pictures, x-ray images, CBCT’s and rapid prototyped models)
  ... affect the orthodontist’s ability to make a diagnosis and elaborate a treatment plan.
- Each orthodontist analysed orthodontic records from 5 different patients that presented with at least one maxillary impacted canine.
- The randomisation and selection of professionals was performed from databases using the website — [https://www.randomizer.org/](https://www.randomizer.org/).
 materials & methods:

 case analysis:
 • cross-over delimitation was used, where the evaluators were separated in two groups: a and b.
 • group a (n=20) evaluated conventional records (cr) first and group b (n=20) evaluated prototyped models (rp) first.
 • in the first stage (t1), the evaluators (a and b) received cases from groups (cr) and (rp) randomly drawn.
 • after that, there was a “wash out” term, which was an interval of 15 days at least (t2), and after that period the groups were interchanged between evaluator from groups a and b.
 • a likert scale (0-5) was the inventory used

data analysis:

 • the data from measurements were organised on an excel table (microsoft office excel, redmond, wa, usa) and analysed with the sigma plot software (sigma plot, san jose, ca, usa)-version 12.0 and analysed in relation to normal distribution (Shapiro-Wilk test and Equal Variance).
 • ANCOVA test was performed to test the difference between cr and rp groups. significance level was established at 5%.
Rapid prototyping

**Materials & Methods:**

**Acquired Exams:**

- All exams were from a single database, and standardised analyzed images.
Rapid prototyping

Materials & methods:

Does it make a difference?
### RESULTS

**Rapid prototyping**

```
<table>
<thead>
<tr>
<th></th>
<th>rapid prototyping</th>
<th>mean 95%CI</th>
<th>conventional records</th>
<th>mean 95%CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>severity</td>
<td>6.63</td>
<td>2.09</td>
<td>6.33-6.92</td>
<td>7.06</td>
<td>1.61</td>
</tr>
<tr>
<td>favourability</td>
<td>3.07</td>
<td>1.03</td>
<td>2.92-3.21</td>
<td>2.92</td>
<td>0.86</td>
</tr>
<tr>
<td>confidence</td>
<td>3.84</td>
<td>0.85</td>
<td>3.73-3.96</td>
<td>3.03</td>
<td>1.06</td>
</tr>
<tr>
<td>time</td>
<td>14:44.5</td>
<td>02:09.0</td>
<td>02:09.0 - 02:15:02</td>
<td>28:00.2</td>
<td>02:59.3</td>
</tr>
</tbody>
</table>
```
Up in the air

Rapid prototyping

efficient & effective - taking the guesswork out!
inexpensive
makes cone beam scans truly 3D

SO WHAT?

patients!
clinicians!
the science of orthodontics/dentistry

WHO CARES?
Rapid prototyping

- significant difference in evaluating the severity, favourability and confidence of the orthodontist between conventional records & prototyped models.
- prototyped models - more reliable & efficient diagnostic aid.
- orthodontists emphatically agree that prototyped models improve patient communication and increase operator confidence.
- traction mechanics more predictable with rp models.

Conclusions

Future Research

- data collection in 4 centres (brazil, canada & australia)
- comparison between different samples
- oral surgeons will also be evaluated
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“machine learning is a skill set that the orthodontists of tomorrow will have to delve into”

- Jorge Faber
“the real danger is not that computers will begin to think like men, but that men will begin to think like computers.”

-sydney harris
a place for everything…

What a dilemma! On the 1 hand, there is such great promise that modern technology can accomplish the dream that orthodontists have had for nearly a century. On the other hand, becoming closely linked with a commercial enterprise whose only goal is profit is a dangerous precedent. The boundary between ours and the oldest profession of them all could become obscured.

A “Place for Everything,” and “Everything in its Place!”

The last Editorial “Up in the Air,”[6] focused on the technological infusions in orthodontics. We discussed the today and a possible tomorrow of our specialty. I share most of my editorials with a very well-respected orthodontist and an important leader of our profession (someone I have grown

a patient of mine). The gentleman went on to explain why he thought that this orthopedic surgeon was the best doctor he had ever been to – “He remembered my wife and daughter’s name, even though I met him 6 years after I was treated by him, and