

Application of Robots in Orthodontics: A Systematic Review

Dr. Ramya Vijeta Jathanna¹, Dr. Arun S. Urala¹ and, Dr. Rithesh Bangera²

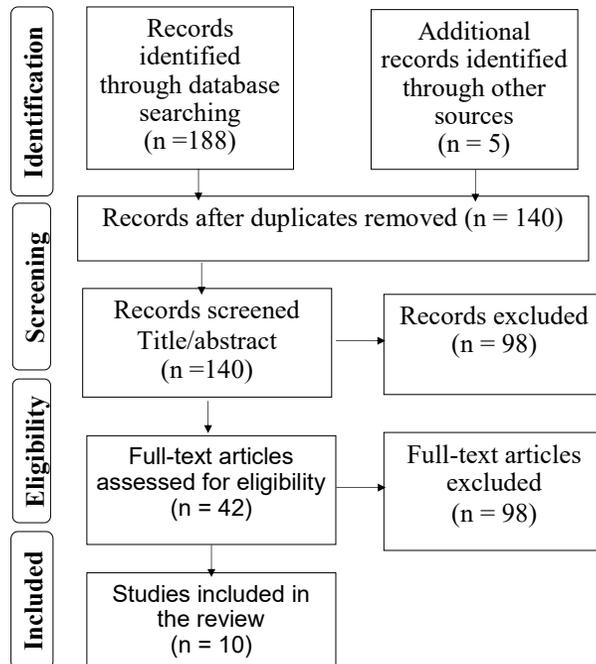
1. Department of Orthodontics and Dentofacial Orthopedics, Manipal College of Dental Sciences, Manipal, MAHE, Manipal, India.
2. Department of Orthodontics and Dentofacial Orthopedics, A. J. Institute of Dental Sciences, Mangaluru, India.

Background and Objective

The use of robots in orthodontics can increase the precision, quality, and safety of various procedures and also reduce the treatment time. The study aimed to provide a current review of the application of robots in orthodontics.

Methodology

Three database searches (PubMed, Scopus, and Web of Science) were conducted through related to robots and orthodontics



Results

Author and year	Robot /Invention	Inference of the study
Jeong Joon Han et al., 2020	Robot arm	Helpful to reposition the bone segments with improved accuracy and safety
Sang-Yoon Woo et al., 2017	Robot arm with six degrees of freedom .	The robotic system can enhance orthognathic surgery through improved accuracy, dexterity, and stability.
W. Joerd van der Meer et al., 2016	Wire-bending robotic machine	Can produce multicomponent dental appliance without the need of physical model of patient's dentition
Ralf Müller-Hartwich et al., 2016	SureSmile technology	The highest precision may be expected for all translational and rotational components of incisor movement.
Alfredo Gilbert, 2011	LAMDA	The third generation wire bending robot formed more accurate bends than manually bent archwires
Theodossy T and Bamber MA, 2003	The robot arm (FaroArm)	Model surgery performed with the aid of a robot arm is significantly more accurate in anteroposterior and vertical planes than is manual model surgery
Matthias Ureel et al., 2021	CARLO® device	CARLO® device could be a useful alternative to conventional burs, drills, and piezosurgery instruments for performing osteotomies
Alana K. Saxe et al., 2010	SureSmile technology	The SureSmile process results in a lower mean ABO OGS score and a reduced treatment time than conventional approaches.
Rohit C.L. Sachdeva et al., 2012	SureSmile technology	SureSmile treatment facilitates more timely care than conventional treatment.
Katsuyoshi Futaki et al., 2016	Patient robot	Patient robot is useful in orthodontic bonding practice

Conclusion

Based on the review it can be concluded that robots in orthodontics can provide improved accuracy, predictability, safety, quality of care with remarkably less treatment time compared to traditional methods. However, due to the heterogeneity of the studies, the generalization of results may be difficult. Further, high-quality research is needed to prove the usefulness of robots in orthodontic practice.

Key references: 1. Han JJ, Woo S-Y, Yi W-J, Hwang SJ. A Robot Arm and Image-Guided Navigation Assisted Surgical System for Maxillary Repositioning in Orthognathic Surgery: A Phantom Skull-Based Trial. *Applied Sciences*. 2020; 10(4):1549. 2. Gilbert A. An in-office wire-bending robot for lingual orthodontics. *J Clin Orthod*. 2011 Apr;45(4):230-4 3. Futaki K, Yamaguchi T, Katayama K, Kurihara A, Yangisawa W (2016) The utility of a patient robot in orthodontic practice. *Dent Oral Craniofac Res* 2: doi: 10.15761/DOCR.1000157. 4. Ureel M, Augello M, Holzinger D, Wilken T, Berg B-I, Zeilhofer H-F, Millesi G, Jurgens P, Mueller AA. Cold Ablation Robot-Guided Laser Osteotomy (CARLO®): From Bench to Bedside. *Journal of Clinical Medicine*. 2021; 10(3):450. <https://doi.org/10.3390/jcm10030450>