'Digitalized Prosthodontics'-Applications of Sundry Software's in prosthodontics- A Narrative Review.

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INTRODUCTION:

With the integration of numerous software tools, the prosthodontic specialty which focuses on the design, fabrication, and fitting of artificial replacements for teeth and other elements of the mouth has made tremendous breakthroughs. The accuracy, effectiveness, and results of prosthodontic treatments are improved by these software programmes. The globe is currently in the digital era. Every industry is using software technology at a rapid pace, and the dental field is no exception. To be competitive in this digital age, dental professionals, including postgraduate students and support lab staff need to be well-versed in the software utilised by the dental industry. So, the purpose of this narrative review was to educate readers about the software that is currently on the market.

Advantages of software in prosthodontics:

There are many benefits to using software in prosthodontics that improve the precision, effectiveness, and general standard of dental care. Here are a few significant benefits that are backed by current studies.

A). Increased Accuracy and Precision: CAD/CAM Technology: High precision is achieved in the design and fabrication of dental prosthesis by using software such as Exocad and 3Shape Dental System.3D imaging: By capturing extremely detailed images, intraoral scanners like the 3Shape TRIOS and Carestream Dental CS 3600 lower the margin of error in dental impressions and improve the accuracy of prosthesis fittings. [1]

B). Increased Productivity and Time Saving: [2]

Simplified Workflow: The amount of time needed to create dental prosthesis is decreased when CAD/CAM technology are integrated into dental clinics.

Shorter Appointment Times: Faster and more effective planning is made possible by digital smile design and planning tools, such DSDApp and SimPlant, which minimises chair time and the number of patient visits.

C). Personalised and Patient-Matched Solutions:

Customised Prosthetics: Software enables the production of highly personalised dental prosthetics that are suited to the requirements of specific patients. Research has demonstrated that designs tailored to the needs of the patient produce better functional and visual results.

D).Digital Smile Design: Clinicians may improve patient satisfaction and make sure prosthetics fulfil aesthetic standards by using tools like Smile Designer Pro, which allow them to simulate and adjust treatment outcomes depending on patient feedback.[4]

E). Better Collaboration and Communication: Enhanced Visualisation: Digital technologies help prosthodontists, dental technicians, and patients communicate more effectively. By displaying possible outcomes to patients, visualisation software can increase acceptance rates and improve decision-making.[5]

F). Interdisciplinary Collaboration: By facilitating the smooth exchange of data between various dental professionals, platforms that combine imaging, CAD/CAM, and practice management systems enhance treatment coordination and results.[6]

G). Economy of Scale: Diminished Material Waste: When it comes to material waste, digital fabrication procedures are more accurate than traditional ones. Numerous cost-analysis studies

on dental practice management have shown that over time, this efficiency results in cost savings. [7]

Long-Term Savings: Although purchasing digital hardware and software may require a sizable initial outlay, over time these expenditures may be offset by lower material prices, fewer remakes, and greater productivity.

H). Improved Predictability and Results [2,3]

Predictive analytics: By analysing large volumes of data, software can more precisely forecast treatment outcomes. There are less difficulties and greater success rates as a result of this predictability.

Consistent Quality: By eliminating human error and the inherent variances in manual processes, digital technologies guarantee consistent quality in the manufacture of prosthetics. The better uniformity of prosthesis made digitally is supported by research. [4]

Some of the available software is already used in prosthetics by both doctors and laboratory staff. Together, these software tools help improve the accuracy, efficiency and quality of prosthetic treatment, resulting in better patient outcomes and smoother dental workflows, which include:

1. Computer Aided Design (CAD) software:

a). 3Shape Dental System: Widely used to design dental restorations including crowns, bridges and implants. It offers comprehensive tools for high-precision design of prostheses.

(b). Exocad: Known for its intuitive interface and flexibility, Exocad is a popular choice for creating custom prosthetics. It supports a wide range of dental treatments and materials.

c). Dental Wings: Offers a variety of CAD solutions for designing dental prostheses, known for its user-friendly interface and robust functionality.

2. Computer Aided Manufacturing (CAM) software:

i). Hyper dent: This CAM software is used in the manufacturing phase, where digital models are converted into physical models using milling machines.

(ii). SUM3D Dental: SUM3D Dental, used in conjunction with CAD software, assists in the precision machining of dentures, ensuring precise fit and finish.

3.3D Imaging and Scanning Software:

3Shape TRIOS: A powerful intraoral scanner that provides high-resolution 3D images of patients' teeth, facilitating accurate prosthetic design.

Carestream Dental CS 3600: Another leading intraoral scanner that captures detailed 3D images and improves diagnostic capabilities and treatment planning.

4. Simulation and Design Software:

SimPlant: SimPlant: Used for implant design, it allows prosthodontists to visualize implant placement in 3D, ensuring optimal placement and results.

BlueSkyPlan: Provides comprehensive tools for dental implant planning, surgical guides and other prosthetic applications.

5.3D Printing Software:

a).Formlabs PreForm: PreForm, specially designed for use with Formlabs 3D printers, allows the preparation and optimization of digital models for 3D printing.

b).Asiga Composer: Used to manage the 3D printing workflow, Asiga Composer helps define tooth models for accurate and efficient 3D printing.

6.Digital Smile Design (DSD) software:

A. DSDApp: Helps prosthodontists design and simulate patient smiles digitally, enabling better visualization and patient interaction.

B. Smile Designer Pro: Provides tools to design aesthetic dental solutions by simulating various restorative options and their effect on the patient's smile.

7. Practice Management Software:

Dentrix: Comprehensive practice management software that integrates with digital imaging and CAD/CAM systems to help prosthodontists manage patient records, appointments and treatment plans.

Eagle soft: Another popular practice management solution that offers robust features for scheduling, billing and integration with dental imaging software. CAD-CAM Software for Prosthetics Computer Aided Design and Computer Aided Manufacturing (CAD-CAM) software has revolutionized the field of prosthetics by improving the accuracy, efficiency and results of prosthetics. The integration of CAD-CAM software into prosthetics significantly improves the accuracy, efficiency and quality of dental fillings. These software solutions enable

more accurate design, smoother workflow and better outcomes for patients, supported by numerous studies and clinical evaluations. Using these advanced technologies, prostheses can provide better care and meet the growing demands of aesthetic and functional prostheses.

Here are some **notable CAD-CAM** software solutions used in dental prostheses:

1. 3Shape Dental System

3Shape Dental System is a comprehensive CAD software that provides tools for designing dental restorations, including crowns, bridges and implants. It offers features such as advanced scanning, planning and treatment planning. Accuracy and precision: high precision in the design of dental fillings. Comprehensive tools: Includes different modules for different types of prostheses. [8,9]

2. Exocad

Exocad is known for its intuitive interface and flexibility, making it a popular choice for creating custom prostheses. It supports a wide range of dental treatments and materials. Easy to learn and use. Supports a variety of dental materials and procedures.[10]

3. Dental Wings

Dental Wings offers a variety of CAD solutions for designing dental prostheses. It is known for its user-friendly interface and reliable features that facilitate the design and manufacture of dental fillings. Strong functionality: comprehensive tools for various dental applications. Designed to be easy to use, reducing the learning curve. [11]

4. Planmeca

PlanCAD Planmeca- PlanCAD is a versatile CAD software used to design many types of dentures. It integrates seamlessly with Planmeca scanning and milling solutions. Works well with the Planmeca ecosystem to streamline workflow. Suitable for restoring different types of teeth. [12]

5. Hyperdent

Hyperdent is a CAM software mainly used in the manufacturing phase. It converts digital models into physical models using milling machines. High precision when grinding dental prostheses. Optimize production processes to reduce time and material waste. [13]

6. Dentsply Sirona CEREC

CEREC is a well-known CAD/CAM system that allows dentists to design and manufacture ceramic dental fillings in a single visit. It combines scanning, planing and milling into one system. Allows fillings to be filled in one reception. Widely used and trusted by dentists.[14]

7.Intraoral Scanner Program

Intraoral scanners are an integral part of modern dentistry, providing accurate digital reproductions that improve the accuracy of dental restorations. Integrating intraoral scanners and their software solutions into dentists increases the accuracy, efficiency, and patient experience of prosthetics. These tools provide high-quality digital impressions that are critical for accurate prosthetic design and improved clinical outcomes. By implementing these advanced technologies, dentists can ensure better treatment planning, shorter chair time and greater patient satisfaction.[15]

A. 3Shape TRIOS:

The 3Shape TRIOS intraoral scanner is known for its high accuracy and ease of use. The software included with TRIOS scanners provides functions for scanning, planning and integration with other dental systems. Produces detailed and accurate 3D images that are easy to use for doctors and seamlessly integrates with other CAD/CAM systems. [16]

B. Carestream Dental CS 3600:

The Carestream Dental CS 3600 scanner is known for its speed and accuracy. The software provides real-time scanning and imaging tools that improve the accuracy of dental impressions. Fast scanning process that improves workflow efficiency. High-quality imaging: Creates detailed 3D images that aid in the precise design of prostheses.[17]

C. iTero Element Align Technology:

The iTero Element scanner is widely used in orthodontic and restorative applications. Its software includes features for real-time scanning, progress tracking and integration with other digital workflows. Allows doctors to view scans in real time, improving patient communication and treatment planning. Perfectly integrates with Invisalign and other orthodontic systems.[18]

D. Planmeca Emerald:

Planmeca Emerald is known for its compact design and fast scanning. The software offers features for color scanning, real-time imaging and extensive integration with Planmeca's digital

dental solutions. Provides fast and accurate digital reproduction. Produces color images that improve detail and diagnostic capability. [19]

E. Medit i500:

The Medit i500 intraoral scanner is known for its affordability and high performance. The included software offers powerful scanning, real-time imaging and cloud storage. Offers high quality scanning at a lower price compared to other leading brands. Makes it easy to save and share digital impressions. [20]

Software used in Removable prosthesis:

Removable prosthesis uses various software solutions to design and manufacture removable dental prostheses such as dentures and partial dentures. Integrating these software solutions into removable denture prostheses greatly improves the accuracy, customization and efficiency of removable denture creation. Using advanced CAD/CAM technologies, dentists can achieve.

Softwares used in dental implant treatment:

A number of digital software tools are available for planning and placing dental implants. Here are some popular references that support their use:

i). 3Shape Implant Studio:

This software allows precise planning of dental implant placement using cone beam computed tomography (CBCT) scans. It provides tools for virtual implant placement, prosthesis-based design, and surgical guide design.[21]

ii). NobelClinician:

This software, developed by Nobel Biocare, facilitates dental implant treatment planning based on patient-specific anatomical data. It allows doctors to practically plan implant sites, design surgical guides and create prostheses. [22]

iii). Simple:

This software provides comprehensive tools for treatment planning and surgical guidance in implant dentistry. It enables precise placement of implants, assessment of bone quality and virtual simulation of implant procedures. [23]

iv). Implant Studio, Dentsply Sirona:

Implant Studio provides clinicians with advanced tools for virtual implant design, including bone assessment, nerve identification and virtual waxing for prosthetic restorations. This enables precise placement of implants and facilitates communication between doctors and dental laboratory technicians.[24]

Exocad- 3.1 Rijeka software series:[25]

This new software includes all the features of exocad software, which allows variety of workflows, and it will smoothly integrate with the any of the hardware.

a). 3.1 Rijeka- for prosthetic-driven implant planning and surgical guide design,

b). Chairside CAD 3.1 Rijeka for single visit dentistry, and

c). Partial CAD 3.1 Rijeka for partial framework designs

Other softwares using in dentistry:

1.**Extra Oral Scanners**:[26]

The advantage with this software, is that, simultaneously two models can be scanned. Compare with existing softwares this is three times faster and scan will be completing within 10 seconds.

This scanner works with 8 cameras with 2 optical lighting units, and claiming 5 ultra micron accuracy, accordance with ISO 12836.

2.3D Face Scan App:[27]

It allows realistic 3D scans of faces of the patients using camera of smart mobile phone, and the AI based software creates a detailed 3D model, later it can be loaded into the Smile Creator Software. It is very handy and easy to use by anyone.

3. H3D, AI CAD design software:[28]

Fully automated and works basing with AI design software. Coming soon: AI to automate CAD for splints, models, crowns, dentures, yet to coming in the market. It can be operated without a CAD operator, can be design multiple cases in very les time.

CONCLUSION: There is a saying, "Steer a ship knowing the destination", it is very suitable quote for this topic. The dental clinician, post graduate students and dental lab personnel should have proper knowledge about the digital softwares for the preparation of predictable, accurate and successful dental restorations.

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