Medico Research Chronicles

ISSN No. 2394-3971

Review Article

RECENT TRENDS IN DENTISTRY

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Submitted on: September 2014
Accepted on: October 2014
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Abstract
The only thing that is constant in this world is 'change'. It is the change and the flexibility to accept it that makes life move on. Our dental field is no exception. With technology and a spirit to move ahead with times, we have come a long way. The goal is to make this into a blessing. We should use these new and naval techniques for constructive purposes. They have to be known to all and sundry so that they are able to serve their purpose in the long run.
Keywords: Dentistry, recent advances, development.

Recent Trends in Dentistry

We often feel what is it that is constant in our lives? We think but we are left unanswered. The reply is a 'change'.

Changes keep happening now and then so that we live a better life as compared to our ancestors. Same is the scene in dental field. Where everything changes, we need to be fully aware about what is happening so that we can provide a great service to the society as a whole.

Equipment Categories (1)

Information Systems

They are:

1) IIS-Intra Oral Imaging System which helps to display specialized intraoral images. It creates digital images that are transmitted to other computers via a modem (teledentistry).Internet and various sites provide live and better exchange of images and data.

2) CIS-Computer imaging system. They are extensions of the above and allow for image modifications. Previously graphic environment TIPS was used, now Windows based software products are being used.

3) CAD/CAM-Computer aided design and computer aided manufacturing create a modified intraoral image which is used as an 'electronic die' to fabricate a restoration. It has Celay, Cerec II and Procera System.

4) Digital Radiographic System (DRS)-They deal with enhancing radiographic images. It has corded, cordless system. Alternative method is using flat bed/35 mm scanner to input convertible film images. Research for TACT is in progress (which use X-Ray source with variable aperture size).

5)Radiographic image processing systems-(Dentascan).They 'read' images from a radiographic film and manipulate them(DF Planner, DFP).

6) Others-Using computer to analyze oral non-image information such as centric relation analysis or periodontal pocket measurements (colorimeters, T Scan, perio record keeping, perioanalysis).

Complete denture (15) roentgenographic examination should be an integral part of diagnosis and treatment planning in full denture construction. Nowadays panoramic radiography is commonly used in large institutional practice as the sole method of screening edentulous patients. The main reason for growing popularity of pantomography is that it provides a radiograph of the entire maxilla and mandible in a single film. It is a time saving, extra oral procedure and radiation dose is smaller than when only periapical films are used(root fragments, retained teeth, radiolucencies, radiopacities, foreign bodies, mental foramina at or near the crest of residual alveolar ridge can be easily seen in OPG).

Treatment Systems (1)

For intraoral hard and soft tissue diseases-

a) Air abrasion systems- Use air-propelled abrasive to remove tooth structure.

B) Laser systems- Use high energy coherent light to cut or manipulate hard and soft tissue.

To relieve the orthodontically (20) moved tooth of the forces exerted by the stretched fibers, circumferential supracrestal fiberotomy (csf) was introduced. In recent years, the use of laser irradiation has been tested as an alternative treatment to conventional CSF. Laser aided CSF (L-CSF) proved to be effective in decreasing rates of relapse following tooth rotation.

Advantages are accelerated wound healing due to biostimulatory effects of laser, coagulation of blood vessels and sealing of lymphatics. It causes less bleeding, maintains a clean, clear surgical field, helps in sterilization of wound during ablation so minimal swelling and lower rates of postoperative infection occurs.

c) local anesthetic delivery systems-

'Oraqix'(18), a recently introduced locally applied anesthetic gel, is a eutectic mixture of prilocaine and lidocaine, each in a 2.5% concentration.

'Vibrajet' utilizes vibration to reduce sensation of pain during injections.

Computer controlled LA delivery systems-eg Wand/Compu Dent, Comfort control syringe, Quick sleeper, Anaeject.

New injection techniques are AMSA and PASA.

'Single tooth anesthesia' incorporates dynamic pressure sensing to provide a constant monitoring of the exit pressure of LA solution in real time during all phases of drug's administration.

'Neosaxitoxin' is a new LA derived from algae, had significantly less postoperative pain and recovered about 2 days sooner than those given the commonly used LA bupivacaine.

d) Pulpal circulation(23)-Recent efforts for assessing pulpal circulation have involved use of Laser doppler flowmetry and pulse oximetry. Pulp vitality test is crucial in monitoring the state of health of dental pulp, especially after traumatic injuries.

Pulse oximetry –It is a noninvasive Oxygen saturation monitoring device widely used in medical practice for recording blood oxygen saturation levels during the administration of i.v. anesthesia. This technique has been used to detect vascular integrity in the tooth. Its wide acceptance in the medical field results from its ease of application and its capability of providing vital information about the patient's status.

Laser Doppler Flowmetry –Pulp vitality implies that blood supply is present within the tissues. Hence, only a test that actually measures or assesses pulp blood flow can be called a vitality test.LDF is a noninvasive, painless, electro optical technique, which

allows the semi quantitative recording of pulpal blood flow. It measures blood flow even in the very small blood vessels of the microvasculature.

Gingival Retraction(2)

In digital impressions(CAD/CAM)-15% aluminum chloride in injectable matrix leaves a clean sulcus. Indirect capture of digitized information is considered more accurate by clinicians.

In implants- cement retained restorations are the choice as compared to screw retained restorations.

Ozone(3)

It is used in almost all aspects of dentistry. There are good evidence of ozone biocompatibility and effectiveness in removing the microorganisms from dental water lines, the oral cavity and dentures. Advantage is it is an atraumatic, biologically based treatment. It is used as a preventive agent in pit and fissure caries and as a therapeutic agent in primary root caries. It is used as an irrigating agent in endodontics, an adjuvant in periodontal surgical and maintenance phase.

Nanotechnology(4)

It will change dentistry, healthcare and human life more profoundly than many developments of the past. Nanodentistry as bottom up approach-for local anesthesia, hypersensitivity cure, nanorobotic dentifrice (dentifrobots), dental durability and cosmetics, orthodontic treatment, photosensitizers and carriers, major tooth repair, bionic mandible, skin grafts, detection and treatment of oral cancer.

Nanodentistry as top down approach-nanocomposites, nanosolutions, impression material, bone substitute, implants, decay resistant tooth and surface disinfectant.

Carbon Nanotubes (21)also called CNTs, are cylindrical 3 dimensional hollow tubes made of carbon atoms at the nanometer range 10,00,000nm.Incorporation of CNTs as nanofillers in composite and epoxy resins increases strength and stiffness. Biocomposites made of collagen and CNTs are capable of replacing biological structures thus enabling regeneration of host tissue and are used in biodegradable implants.

CNTs are used for making nanoprobe devices designed to investigate and obtain information from a remote region or cavity. They are highly suitable materials for atomic force microscopy(AFM) probes. Due to their small size, increased surface area and excellent depth of penetration into dentinal tubules, CNTs may be studied for targeted drug delivery as an antimicrobial agent in endo therapy to eradicate E. faecalis and to occlude the tubular orifices for the management of dentinal hypersensitivity.

Digital Fluoroscopy(5)

It can be a very useful tool for the evaluation of denture mobility in interference free conditions as well as is a valuable diagnostic aid for temporomandibular joint disorders and designing of prosthesis for cleft palate patients.

In this technique, an image is transmitted to a monitor so that the body part and its motion can be seen in detail. Prosthodontics plays a major role in rehabilitation of stomagnathic system. This technique also helps to monitor the progress of active treatment methods to evaluate prosthodontic treatment functional results and can be used as a jaw tracking device. It provides a useful research tool, a diagnostic aid and a therapeutic monitor of the progress. The amount of radiation used during this procedure is considered as minimal and therefore the risk of radiation exposure is very low.

Endodontic Stabilizers(6)

The most common treatment alternative to midroot fractures is the extraction of the apical fragment. However, this treatment compromises the crown root ration. To compensate for the reduced crown root ration, the use of endodontic stabilizers has

been attempted by Frank. The endodontic endosseous implants were first reported by Strock and Strock in 1943.According to Weine, the endodontic stabilizers with no communication between oral cavity and the implant appears to have an outstanding chance for long-lasting effectiveness. Feldman and Feldman advocated the use of endodontic stabilizers as a mean of stabilizing and retaining seemingly non retainable teeth. Endodontic stabilizers are biocompatible and have the additional advantage of maintaining the periodontal membrane attachment of the remaining tooth.

The basis for an endodontic stabilizer is the use of chrome cobalt pin as the implant material. This alloy is composed of 65% cobalt, 30% chromium and 5% molybdenum. Bernier and Canby have verified nonelectrolytic, inert properties as well as excellent tissue tolerance to the material. The endodontic stabilizer increases the root anchorage in the bone by the extension of the artificial material beyond the limit of the alveolar socket within the limits of the alveolar bone and thus helps in stabilizing the teeth with compromised alveolar support.

Successful result of the endodontic endosseous stabilizer is seen when it is placed in conjunction with surgical intervention.

Platelet rich fibrin(7)

A recent innovation in dentistry has been PRF, a concentrated suspension of the growth factors found in platelets. These growth factors are involved in wound healing and promote tissue regeneration, since PRF is both nontoxic and nonimmunoreactive, it is applied along with bone graft material for better bone regeneration and soft tissue healing. Platelet rich plasma can also be infused into resorbable barrier membranes to retard epithelial migration and to provide localized growth factors for hard and soft tissue maturation. Platelet rich plasma may be obtained from autologous blood by the use of plasmapheresis. Platelet rich fibrin was developed in France by Choukroun et al. This second generation platelet concentrate eliminates the risk associated with the use of bovine thrombin. Platelet of PRF membrane in recession defects restores the functional properties of the labial gingival of the mandibular anterior teeth by repairing gingival defects and re-establishing the continuity and integrity of the keratinized gingiva.

Platelet rich plasma(8)

A radicular lingual groove can be managed using bone grafts and platelet rich plasma. These grooves are locus for plaque accumulation(mostly in lateral incisors) which destroys the surrounding tissues, hence causing the localized periodontal defect.

Mini dental implants(9)

Every dentist has experienced the problem of dealing with patients with atrophic ridges. The patients always return with complaints of pronounced in the mandibular arch. Traditional dental implants require a period of healing and tissue integration in a nonleaded capacity for optimum predicatability. These implants can be immediately loaded and provides ongoing stabilization. The advantage is the minimally invasive, single stage placement procedure, which consists of turning the implant into the bone through a starting opening, but not a prepared bone site. Hence, there is no bone damage or bone wound during implantation. Bleeding and postoperative care is decreased and most importantly healing time is shortened.

These implants are ultra-small diameter(1.8mm width), biocompatible it alloy implant screws, conceived and designed over 20 years ago by a board certified Manhattan dentist, Victor I.

Sendax. Dr. R. A. Bulard added a single one piece 'O-Ball' design to Dr Sendax's concept.

Metal Free Restorations(10)

Highly challenging anterior teeth restorations has led to the development of metal-free restorations. They have a strong ceramic core onto which layering ceramic is applied to achieve a natural appearance. These all-ceramic systems can be categorized broadly into 2 groups, based on the ceramic core they have:

I)Translucent core-For eg Lucite core-IPS Empress, Esthetic Lithium Disilicate core-IPS emax.

ii)Opaque core-For eg Lithium disilicate core-IPS emax, Alumina core-in ceram Alumina, Procera all Ceram.

Zirconia core-Lava, Cercon, Procera, Zirconia, Cerona.

All ceramic crowns with translucent core are superior in aesthetics, but weaker in strength. These crowns can be used to cover acceptably colored dentin and at times for anterior fixed partial denture prostheses(FPD) where the masticatory load is less. Crowns with an opaque core are indicated for teeth with heavily discolored dentin or over metal posts and can be used for posterior crowns and some can be used for posterior FPD as they have superior strength.

Acetal Resin(11)

It always a challenge to obtain optimal esthetics while maintaining retention, stability and healthy tooth structure with cast partial dentures. Acetal resins are highly versatile engineering polymers that bridge the gap between metals and ordinary plastics. Because they offer the strength of metal and the flexibility and comfort of plastic, they make an ideal material for the fabrication of dental prostheses, particularly clasps. They are monomer free and offer an innovative and safe treatment alternative for patients who are allergic to conventional resins. For patients who do not wish to have metal in their mouth, for cases where no preparation of teeth is desired, or in periodontally compromised cases where minimum stresses onto the abutments are desired, acetal resin partial and removable bridges offer a vastly expanded range of applications.

Glass fiber reinforced composite(12)

The development of dentin adhesive systems has led to simpler and minimally invasive preparations. Adhesive resin cements are composite resins that have a decreased proportion of filler, with an organic polymer matrix of bis-GMA and UDMA, an inorganic filler, bonding agent, initiators and pigments. Newly introduced resin luting agents have higher proportions of filler. The combination of the resin luting agent and bonding system is one of the most important factors for retention of these restorations.

These have potential to be used as long-term provisional restoration. Continuous fiber-reinforced composites have good flexure strength and other desirable physical characteristics as a fixed prosthesis substructure material. In addition, FRC substructure is translucent and requires no opaque masking, which allows for a relatively thin layer of particulate covering composite and excellent esthetics. The light polymerized FRC substructure retains a sticky oxygen-inhibited layer on its external surface that allows direct chemical bonding with the covering composite. Although, unnecessary preparation and etching of the abutment teeth(though minimally done) is an irreversible damage.

Retrograde materials(13)

The root end filling material should provide an apical seal to an otherwise unobturated root canal or improve the seal of existing root canal filling material and be biocompatible with periradicular tissues.

Newer modifications of Zinc oxide eugenol compounds as IRM and Super EBA provide

a better apical seal. Cavit is a Zinc oxide based temporary filling material. It is soft when placed in tooth and subsequently undergoes hygroscopic set after permeation(18%).This rationalizes its use as a root end filling material. Chong et al used light cure, resin reinforced GIC as a RFM. It showed least microleakage due to less moisture sensitivity, less curing shrinkage and deeper penetration of polymer into dentin surface. Newer GICs containing glass metal powder have less leakage and showed no pathologic signs.

Use of MTA(14) as a retrograde material is due to its excellent biocompatibility namely, minimal toxicity and pulpal irritation, mild periapical inflammation, non mutagenicity, cell adherence and growth, increased level of alkaline phosphatase and osteocalcin, interleukin production(IL-6, IL-8), periodontal ligament attachment, cementum growth and dentinal bridge formation.

Finite element analysis(16)

This is a relatively recent discipline that has quickly become a mature method, especially for structural analysis. The method is fully capable of delivering higher quality products in a shorter design cycle with a decreased chance of field failure, provided it is applied by a capable analyst. It is used in Implant dentistry, Prosthodontics and Periodontics to study stress patterns related to structural behavior of oral tissues(in FPD and RPD).To optimize the design of dental restoration and to investigate stress distribution in tooth with cavity preparation and biochemical preparation during root canal treatment.

Tissue engineering(17)

The best replacement for tooth would unquestionably be(when prosthesis and implants are undesirable) a tooth that is grown from the patient's own stem cells which is called a 'bioengineered tooth.'

'Bioengineering/tissue engineering' is the application of engineering to the field of biology and medicine, and it aids in the development and replacement of defective or missing body organ. It is also called 'biomedical engineering'.

Tooth agenesis(19)

It is the most prevalent craniofacial congenital malformation in humans. The study of tooth agenesis and genes producing the molecules involved in tooth agenesis have led to the development of experimental tooth regeneration techniques such as tissue scaffolding and tissue engineering. In addition, the association of genes such as $AXIN_2$ and PAX_9 to both tooth agenesis and colorectal cancer has shown the potential of using tooth agenesis as a genetic marker for the diagnosis of cancer.

Cheiloscopy as an aid to Forensic Methodology(22)

The positive identification of living or deceased persons using the unique traits and characteristics of the teeth and jaws is a cornerstone of forensic science. The wrinkles and grooves on the labial mucosa(called sulci labiorum) form a characteristic pattern called 'lip prints', the study of which is 'cheiloscopy'. It is a relatively new field among the large number of identification tools available to the forensic expert.

Lip prints recover after undergoing alterations like minor trauma, inflammation and diseases like herpes. Lip prints can be found on surfaces such as glass, clothing, cutlery or cigarette butts. Even the invisible lip prints can be used and can be lifted using aluminum and magnetic powder. The edges of the lips have sebaceous glands, with sweat glands in between. Thus secretions of oil and moisture from these enable development of 'latent' or persistent lip prints analogous to finger prints.

Conclusion

The field of dentistry is changing everyday. The equipments and tools are becoming more digital and electronic. It is necessary

that the clinician be well informed about these advancements so that he can provide suitable service to the patients on the whole.

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