Innovations

Green Orthodontics: An Eco-friendly Perspective in Dental Practice

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Abstract:

Since decades, the influence of human practices on the environment has been a major concern globally. Today's scenario necessitates understanding the grave demand of being eco-friendly in every facade of our lives which duly involves the dental practice. So, practising green dentistry helps us to identify simple measures a dentist and their patients take to reduce waste and conserve energy, as well as promoting awareness of the environment and getting local communities involved in green living. Green Orthodontics is a high-tech approach that reduces the environmental impact of dental practices and encompasses a service model for dentistry that supports and maintains wellness. It meets the needs of millions of wellness lifestyle patients, and helps dental professionals protect planetary and community health, as well as the financial health of their practices. Practitioners still needs a lot of knowledge and training to increase their awareness. The more the number of dentists and healthcare professional join the green dentistry movement, the faster we make our practice and our world, a cleaner and a healthier place for living.

Keywords: *Dental, public, green, practice, management*

Introduction:

Good oral health is not only essential for good overall health and freedom from the pain and suffering associated with oral health problems, but also influences self-esteem, quality of life for environmental sustainability.[1]Since decades, the influence of human practices on the environment has been a major concern globally. Today's scenario necessitates understanding the grave demand of being eco-friendly in every facade of our lives which duly involves the dental practice. Ergo, it is the call of the clock for the dentists to become environmentally sensible and direct themselves to an eco-friendly dental practice.

The colour green has a power of healing which symbolizes good health and it is considered to be the most relaxing and soothing colour. Green can help in maintaining the balance between our mind and the body and can also enhance a vision, stability and energy. Renewal, growth, freshness and hope are all related to this colour and it indicates the safety in drugs and medical products[2]and also symbolizes the natural vegetarian in food products

Nowadays Government is also taking various measures to protect and save the ecology which increases an awareness amongst everyone to preserve the environment. Even the healthcare professionals including dentists, are taking steps to save the environment; from switching to different types of technology to turning off taps and lights, every little helps.[3]So, practising green dentistry helps us to identify simple measures adentist and their patients take to reduce waste and conserve energy, as well as promoting awareness of the environment and getting local communities involved in green living.[4]

It's easy to dismiss green dentistry as another attempt to "greenwash," i.e. make our profession trendy by saying the methods we use are good for the environment. However, green dentistry is no small part of the changes we as a society need to make. Climate change, plastic pollution, and declining species are evidence that we all need to make changes in ways that help the environment

Steps To Be Taken:

Practising sustainable dentistry consists of rethinking consciousness and attitudes; changing the way in which the dental office is seen; implementing simple changes by taking into consideration that this is a continuous process. In addition, the team must be trained, with each member doing his/her part and knowing the sustainable practices.[5,6]

From the time of patient entrance till the clinical attendance, sustainable practice in the dental office begins. Sustainable practices likeminimizing the volume of trash generated by disposable materials, which converts organic into inorganic form; cleaning the air conditioner filters; use of a rain water harvesting system with filtration technique; use of motivational stickers against wasting water; use of a toilet basin that saves water are important items for performing eco-friendly orthodontic practise.[7]

Orthodontic Clinic Reception Room:

1. Use of corn starch or glass cups instead of plastic disposables can reduce solid waste residues
2. Use of LED power bulbs instead of fluorescent /incandescent bulb can reduce electricity consumption upto 80%.
3. Use of motion sensor switches in less frequently used areas can also help in saving electricity.
4. Digitizing all the paper work can reduce use of paper and hence help in the best use of resources.
5. Furniture made of wood instead of synthetic non-recyclable material will reduce gas emission into the atmosphere.
6. Disposing recyclable material like paper in a separate bin can help in recycling.
7. Use of real plants for decoration instead of artificial plants will purify the atmosphere and reduce CO_2 content.

Orthodontic Consultation Room:

1. Use of automatic chair with LED light and pre-programed commands instead of mechanical chair with halogen light will conserve energy and can save electricity upto 15%.
2. Disposable suctions should be replaced by paper cups or suctions made of paper.
3. Similarly disposable instruments and materials should be replaced by reusable and sterilizable instruments. This will help reduce the garbage.
4. Use of digital radiograph instead of conventional radiographs will help in savings of water, energy and reduction of solid residues arising from the process of development and storage of radiographs.

5. Digital filing of all the patient documents instead of paper stored in plastic bags.Faucets with action on pedal saves water and reduces cross contamination instead of using faucets withstop-cock for opening.

Sterlization Room And Equipments:

Sustainable practice in the orthodontics can be started as the patient enters the clinic till the used instruments gets cleaned and sterilised. To attain a sustainable practise in sterilization room the use of unnecessary and harmful chemicals should be minimised by promoting more of steam sterilization. patients bib and instruments should be cleaned, washed and sterilized regularly rather than using disposable bibs, which will further add to the solid waste. instruments should be kept in FDA- approved reusable pouches and wraps for sterilisation rather than plastic bags. Sterilization of several materials and at one time will reduce water and electricity wastage.

Rest Room:

1. Use of hygienic shower with recyclable toilet paper instead of conventional toilet paper will produce less garbage.
2. Use of motion sensor light will help save electricity.
3. Use of motion sensor taps will reduce water waste.
4. Use of clean washable towels instead of paper towel will help reduce paper wastage.

Management Of Waste In Orthodontic Practice:

Waste Management is really an important subset of dental practice. To reduce the hazardous effects, a rigorous waste management system should be implemented in practice.[8]The rules make it mandatory for the health care establishments to segregate, disinfect, and dispose their waste in an eco-friendly manner.[9]Orthodontists should make themselves aware regarding the proper biomedical waste management in order to reduce the hazardous effect caused by Biomedical waste not only to environment but to themselves.

Refer to Table 1.

Biomedical Waste	Method Of Disposal
Impression Material (Discarded/Used)	Immerse in 1% Sodium hypochlorite solution11 and dispose as general waste
Dental Casts (Discarded/Used)	Immerse in 1% Sodium hypochlorite solution11 and dispose as general waste
Wires, steel ligatures, burs, blade, needle after being burnt	White sharp container
Metallic brackets, bands, buttons and other	White sharp container

attachments	
Plastic and Ceramic brackets	Red Bag
Removable appliances with wire component like expansion appliances (Used/broken not to be worn by patient anymore)	White sharp container
Orthodontic mini-implant, vials, ampules	Blue container
Wax bite registration	Red Bag
E-chain, elastic ligatures, elastics	Red Bag
Surgical and examination gloves	Red Bag
Blood or saliva contaminated cotton, gauze, linen, paper, sutures	Yellow Bag
Face masks, gowns	Yellow Bag
Syringe after breaking hub in needle destroyer	Red Bag
Extracted teeth and tissues	Yellow Bag
Discarded and unused medicines	Yellow Bag
Plastic suction tips, eye shield	Red Bag
Aligners	Red Bag
Primer bottle, composite syringe	Red Bag

Table 1: Orthodontic Waste Disposal Protocols[10]:

Disposal of PPE Kits:

The disposal of personal protective equipment (PPE) in the current novel coronavirus (COVID-19) pandemic has exacerbated the plastic crisis.

Mostly, PPE mostly contain polypropylene, which can be turned into petrol by pyrolysis. This is a chemical process of breaking down plastic in absence of oxygen at a high temperature — between 300-400 degrees Celsius for an hour.

The cracking process breaks down the long polymeric chains into useful, smaller molecular weight compounds, which can be utilised as fuels or chemicals in various applications.[11]

Disposal Of Gloves:

There is a need for adopting innovative approaches which will always remainat the forefront in the advancement toward sustainability. University of Michigan is the first dental clinic to implement a glove recycling program, with the goal of waste reduction and sustainability.[12]

The Four R Model:

There are various techniques to reduce the impact of harmful environment related common products and materials which can be used for orthodontic treatment purposes. Eco-friendly orthodontic offices and clinics can also implement the Four R model: reduce, reuse, recycle and rethink (Figure 1).[13] The four Rs emphasize sustainable consumption habits in an effort to minimise waste.

Fig1. The Four R model.[13]

Dental practices are encouraged to become proactive in implementing the Four R model, as it will definitely plays an important role in making our environment greener.[14]The reduction component focuses on unnecessary generation of waste, minimizing dumping and sanitary landfill waste and conserving renewable energy and non-renewable resources.[15] A huge source of dental landfill waste involves disposable products. The maximum utilization of biodegradable materials can offset some of the reliance on disposables.[16] Because plastic decomposes very slowly, orthodontist may wish to consider materials that are in better alignment with the goals of eco-friendly orthodontics.

The next category emphasized in promoting the use of reusable products rather than disposable products (Figure 2). Reusable products can reduce the need to create new products, thus reducing energy consumption.[17]Much of the waste sent to landfills can be recycled; with this goal in mind, manufacturers should strive to develop innovative recyclable orthodontic products. There are various ways, an orthodontist can rethink to make their practice sustainable in providing the best care and treatment to the patients. Best practice management approaches are essential if the profession is to thrive in an environmentally conscious era (Table 2).

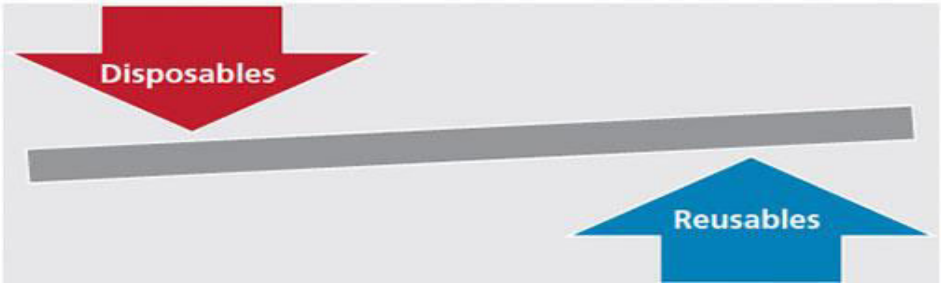

Fig2. The increased use of reusable dental products can reduce the negative impacts of disposable waste.

Orthodontic Material	Substitutes	Advantage
Adhesive systems with acid etching	Self-etching adhesive systems[18]	Lower water consumption due to no need for washing and drying, with same clinical efficacy
Conventional brackets	1.Self-ligating brackets[19] 2. Aligners	1.Less chair time and eliminates the use of elastomers. 2.Aligners are BPA free, which are tocic material.
Use of non-sterilizable orthodontic archwires.	Use of orthodontic archwires capable of being sterilized[20]	Reduce discard of solid residues that may have been contaminated before use in the patient
Rebond new brackets when they debond during treatment	Recycle brackets by roughening their base with aluminum oxide and performing new bonding[21-23]	Eliminate solid residues that would go to the trash can, making it possible for them to have a longer useful life
Light polymerization with conventional halogen or LED appliances	Ultra-rapid LED light polymerizers[24]	Shorter chair time and use of LED lamp with low energy consumption
Use of synthetic intermaxillary elastics	Use of elastics made of latex[25]	Latex is extracted from a tree, consequently there is need to cultivate trees, therefore, the more the use of latex, the more the number of trees will be used.
The use of a new mini-implant in a patient who needs to replace the one in use	Sterilization and use of the same mini-implant that was removed in the same patient.[26]	Reduction of solid residues that are constituents of the mini-implant

Table 2: Orthodontic Materials And Their Eco-Friendly Substitutes:

Green DOC™ Certification- The EDA's GREEN DOC™ CERTIFICATION is a comprehensive program that rewards dental offices for eco-friendly initiatives in the areas like dental procedures, office administration, marketing, office designs and constructions to achieve bronze, silver or gold EDA certification.

The GREEN DOC™ checklist outlines required standards and recommended initiatives within eight categories of eco-friendly practice.

Fig 3. Standards of eco-friendly practice

Conclusion:

- Green Orthodontics is a high-tech approach that reduces the environmental impact of dental practices and encompasses a service model for dentistry that supports and maintains wellness. It meets the needs of millions of wellness lifestyle patients, and helps dental professionals protect planetary and community health, as well as the financial health of their practices. Together, green orthodontic practice and companies offering green orthodontic products are transforming the dental industry through adoption of the EDA's green dentistry model.
  Practitioners still needs a lot of knowledge and training to increase their awareness. The more the number of dentists and healthcare professional join the green dentistry movement, the faster we make our practice and our world, a cleaner and a healthier place for living.

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