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Green Orthodontics: A Sustainable Approach

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ABSTRACT:

In today's modern society, it is paramount to understand the importance of being green in all aspects of our lives, including dental care, which will have a huge impact on our environment and ecosystems that generate large amounts of waste. The various dental treatments associated with excessive use of water and electricity, in particular, underscore the need for to transition to a 'green dentistry'. Green dentistry not only means environmentally friendly, but also uses the latest technologies and procedures to dispose of waste. Reduce and save energy, reduce pollution, free up time and money, and thereby improve the environment and humans threats of rapid urbanization in developing countries**.** We humans need to reconsider our attitude in order to keep the planet healthy and available to our descendants. But when you think about orthodontics, what can you do as an orthodontist? From this perspective, aim of this review article is to present a simple and sustainable method during clinical practice as orthodontists to minimize the impact on nature by humans.

KEY WORDS: Green dentistry, sustainability, orthodontics.

I. INTRODUCTION:

In recent years, environmental awareness or ecological awareness has increased dramatically. This led to a global movement leading to green transformation, in which the term "green" is defined as an action aimed at improving the environment and community health by protecting resources and minimizing harmful effects on the environment. The practice of green dentistry or ecological dentistry can contribute to more sustainable resources and a healthier environment. Patients can seek dental professionals who share the same values as the earth's health. Therefore, by adopting environmentally friendly practices, dental clinics can bring social value to the communities in which they are rooted. [1] Sustainability defined by the University of California is the quality that does not damage the environment or consume the earth's natural resources. [2]

The field of orthodontics is changing rapidly today as technological advancements provide new and better treatment options that can reduce treatment times and conserve natural resources. The National Environmental Policy Act of 1969 commits the United States to sustainability, declaring that it is a national policy that "creates and maintains the conditions under which man and nature can exist to harmonize production and allow the social, economic and other demands of the present generations to be met. [3] For this reason, there is an increasing push in the field of orthodontics for Orthodontists to adopt a more sustainable approach to the practice of medicine and the treatment of patients, an approach that minimizes waste disposal and the toxic load on our planet.

SUSTAINABLE ORTHODONTICS:

All materials used in orthodontics affect the environment. A good orthodontist will look for ways to eliminate waste. The use of biodegradable packaging and plastics is essential for any industry, especially for dental care companies that provide services to the orthodontic industry. A good orthodontist will keep the patient from seeing things, but it does help reduce the footprint. In orthodontic practice, it is also necessary to adopt measures to reduce environmental damage. The materials used for orthodontics must be reconsidered and selected according to the environmental impact they may cause. For example, when using traditional adhesive systems, the use of self-adhesive systems eliminates the need for washing steps; thereby reducing the amount of water used in this process. Things like recycling brackets by roughening their base with aluminium oxide and performing new bonding. Things like this help us to know the efforts put in place by the industry, things we may never see. The utilization of latex materials is additionally a simple thanks to look after the world.New sustainability practices can and should be added to the list described here, so that sustainability is a regular part of all of us in the course of our careers.

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THE FOUR R MODEL FOR ORTHODONTIC CLINIC:

There are ways to reduce the negative environmental impact of common products and materials used for disposal. Eco-friendly dental practices and clinics can implement the Four Rs model: Reduce, Reuse, Recycle and Rethink (Figure 1). [4] The Four Rs focus on sustainable consumption efforts to reduce waste.

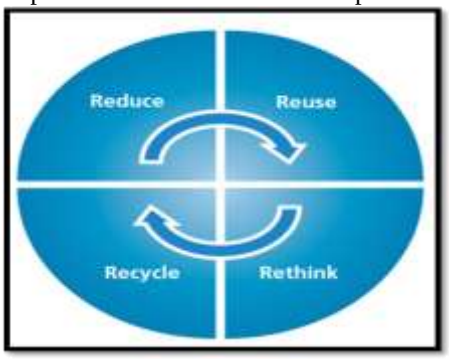

Fig 1: Four R model in orthodontic clinic

1) WASTE REDUCTION :

Effective waste management is a key concept of green dentistry. Whileseeking to minimize waste, environmentally conscious practices can still comply with the latestCDC dental environmental guidelines. [5] Reducing product usage is aneasy first step. (Table No.1)

What is done	What can be changed	What is saved
Furniture made of synthetic, non-recyclable materials	Use of furniture made of reforested wood	Lower emission of gases into the atmosphere, and these are biodegradable
Magazines and newspapers on paper or plastic	Tables with access to Internet so patients can entertain themselves before being attended to	Elimination of solid residues
Use of disposable cups	Use of corn starch or glass cups	Less production of solid residues
Patients records on paper, stored in plastic folders	Digital file of all patients' documentation	Eliminates the use of paper and plastic, as well as economy of storage space
Prefer disposable instruments and materials	Prefer reusable and sterilizable materials and instruments	Lower amount of garbage
Artificial plants and ornamentation	Use real plants	Avoids the use of plastic materials and promotes transformation of CO2 into O2 through photosynthesis by plants
Use plastic bags for packing the materials to be autoclaved	Use FDA-registered reusable pouches and wraps for sterilization	Saves money and reduces solid residues
Orthodontic accessories sold in conventional packaging	Brackets sold in receptacles with a larger quantity of accessories, with these receptacles being manufactured of a recyclable product	Elimination of packaging made of plastic materials, being replaced with biodegradable materials
Paper towel	Electric dryer for hands	Less production of solid residues
Alginate impressions	Digital models	Reduces solid residues

Table No. 1: Waste reduction in orthodontic clinic

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2) HAZARDOUS AND CHEMICAL WASTE :

The principles of green dentistry also call for the elimination or reduction of chemical and hazardous wastes, and the management and disposal of them in an environmentally responsible manner. (Table No. 2) [6]

What is done	What can be changed	What is saved
Conventional detergents for cleaning	Biodegradable detergents	Lower quantity of toxic residues in water
Use of chemical materials in disinfection	Use of sterilization by steam	Reduction of toxic garbage
Use of conventional radiographs	Use of digital radiographs	Savings of water, energy and reduction of solid residues arising from the process of development and storage of radiographs
Conventional brackets	Self-ligating brackets	Eliminates the use of elastomers

Table No.2: Hazardous and chemical waste management in orthodontic clinic

3) REDUCTION OF ELECTRICITY AND WATER CONSUMPTION:

ADA points out that reactiveness starts with adapting to green habits and policies. Dental teams can start by installing energy-saving equipment, switching to green products, saving energy and resources, reusing and recycling, and providing appropriate patient education. [7] To save energy and resources, the dental team must complete an office energy audit and develop a power management plan. Doctor clinics can also save electricity by using LED lights, which can reduce energy consumption by 70%.(Table No.3)

What is done	What can be changed	What is saved
Use of incandescent or fluorescent lamps	Use of LED lamps[8]	Lower electrical power consumption up to 80%
Use of switches	Use of movement sensors in less frequently used areas.	Lower electrical power consumption
Use of electronic appliances without power consumption classification	Use of electronic appliances with low energy consumption	Lower electrical power consumption
Use of tube, LCD or plasma television sets	Use LED technology television sets	Lower electrical power consumption with savings of up to 80%
Sterilize only one or a few materials in an autoclave cycle	Sterilize several materials together in one autoclave cycle	Electrical power and water saving
Use of mechanical chair	Use of automatic chair with preprogrammed commands	Shorter time of movement, that is, less energy spent
Halogen light reflector	LED light reflector	Energy saving to the order of 35%
Adhesive systems with acid etching	Self-etching adhesive systems[9]	Lower water consumption due to no need for washing and drying, with same clinical efficacy
Light polymerization with conventional halogen or LED appliances	Ultra-rapid LED light polymerizers [10]	Shorter chair time and use of LED lamp with low energy consumption

Table No. 3: Reduction of electricity and water consumption in orthodontic clinics

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4) TRANSITION TO REUSABLE ITEMS:

According to the Eco-Dental Association, by switching to reusable items, dental clinics can reduce the number of disposable items by thousands each year. [11] For example, choose a reusable sterilization bag approved by the US Food and Drug Administration. The Eco-Dental Association estimates that "by switching to reusable use, a doctor can transfer up to 4,680 paper and plastic autoclave bags per year". Another option is to replace paper and plastic bags with compostable bags. These bags are made of corn starch, potatoes and soybeans and are completely biodegradable. (Table No. 4)

Conventional practice	**Suistanable practice**	**Benefit**
Use conventional paper for printing	Use recyclable paper	Making best use of resources
Orthodontic accessories sold in conventional packaging	Brackets sold in receptacles with a larger quantity of accessories, with these receptacles being manufactured of a recyclable product	Elimination of packaging made of plastic materials, being replaced with biodegradable materials
Use of non-sterilizable orthodontic archwires.	Use of orthodontic archwires capable of being Sterilized [12]	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 withaluminum oxide and performing new bonding [13,14]	Eliminate solid residues that would go to the trash can, making it possible for them to have a longer useful life
The use of a new mini-implant in a patient who needs to replace the onein use	Sterilization and use of the same mini-implant that was removed in the same patient.[15]	Reduction of solid residues that are constituents of the mini-implants

Table No. 4: Reusable items in orthodontic clinics

INVISALIGN: ECO-FRIENDLY ORTHODONTIC PRACTICES:

This is the latest and most effective way to reduce any orthodontic footprint. Using Invisalign or 3M Clarity transparent aligners reduces or even eliminates the need for wires, braces and elastic bands, and is easier to see during your treatment. Many patients are interested in Invisalign because the appliance can be removed for special activities and daily cleaning. They are more comfortable than permanent braces and are usually less noticeable. But there is another benefit that you may not overlook, that is, aligners can also be a more environmentally friendly and sustainable option.

The aligners does not contain BPA (bisphenol A), which is important because BPA is an estrogen and is associated with an increased risk of certain cancers and other health problems. BPA is also toxic to the environment. Since aligners are now a popular choice among teenagers and adults, it is important to ensure that orthodontists use only the safest materials to make orthodontics.

II. CONCLUSION:

Therefore, we can recognize that it is possible to practice sustainable orthodontics that protects the environment with the individual and collective consciousness of the team. Also helps restore the planet by saving costs and the environment and reducing the environmental impact of practices, including cautions from the use of natural resources.

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