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Review Article

Hinduism and Prosthodontic Treatment: A Review and a Clinical Report of a Hindu Menopausal Woman

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Abstract

Hinduism is one of the world's most populous religions. A matter in everyday dentistry is the use of products and materials that could limit dental treatment options because of religion. Menopause is a specific and critical period in a woman's life when dental restorations or other dental procedures are needed. Some menopausal women face difficulty when performing dental care due to restrictions concerning their religion or vomiting symptoms. Religion and a hypersensitive vomit reaction in menopause may prevent the dental provider from choosing extended or complicated dental, mainly prosthodontic, treatment plans including bone grafts and dental implants, and consequently, these parameters can affect menopausal women's quality of life.

The purpose of this article is to review the current literature and to report a case of a 60-year-old Hindu menopausal woman, partially edentulous with an exaggerated vomiting reaction, focusing on successful clinical management using a simple but effective table salt technique for the gag reflex and proper fixed and removable prostheses design, as also to discuss how Hinduism affects the dental treatment plan, especially prosthodontic, because some products and their consistency used in dental implants and prosthodontics, are usually not acceptable due to this religion, affecting also menopausal womens' quality of life.

Because of the shift of population globally, the scientific community faces patients of different religions, faiths, traditions, and beliefs, and has to adjust socially to new conditions.

Introduction

A patient's religion or religious beliefs can cause conflict regarding medical care and have the potential to influence medical decisions [1].

Among the largest (by the number of adherents worldwide) religions, the rules and customs related to the use of medical products derived from animals may differ between religious branches and individuals [2,3]. Certain religious groups have beliefs regarding the use of bovine and porcine products that could limit treatment options during surgery, particularly as many surgical products contain restricted or prohibited materials [1-4], something very important for an everyday dental practice.

Hinduism is World's third most populous religion with about one billion believers mainly from India, Nepal, and Mauritius [5]. Hinduism is very much decentralized and there is not one standard set of beliefs. Each Hindu has his or her own individual scholar, scripture, or tradition to refer to. In fact, Hinduism can be more closely related to a collection of religions than one central faith [6]. There are two major religious schools in the world: Abrahamic and Dharmic. Dharmic religions are a family

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of religions consisting of Buddhism, Sikhism, Hinduism, and Jainism from India. These religions can also be classified as Eastern religions. The number of studies in health area and religion has been increasing gradually over years [6,7].

Many medical and surgical implants and medications are made from bovine or porcine material; hence, their use among certain religious groups could be deemed insensitive. Unfortunately, in some situations, Hindus and Sikhs do not accept the use of any animal-derived (from cows or pigs) medications, products, and surgical implants [1-4,6,8,9].

Ethical dilemmas could be caused by the use of these surgical materials, as there is no written evidence about the stance of Hinduism on the use of bovine material in surgery. The animal-derived materials could potentially influence consenting practices and cause religious distress to patients, particularly if no alternative nonanimal product is available [1].

There may be varying degrees of observance, belief, and practice among Hindu patients [1]. Hindus take offense at medication containing bovine material, and issues arise when products such as gelatin (widely used in drug capsules, anesthesia, and intravenous fluids for resuscitation) are given [1,10,11].

However, it is not clear among medical professionals if these restrictions translate into restrictions regarding the receipt of medications or surgical implants containing human or animal (bovine or porcine) tissue [1,6].

Patient autonomy is a pressing concern when a recommended treatment conflicts with a patient's spiritual or religious beliefs [4]. Dental practitioners need to understand that religious/cultural sentiment though not important to them can be important for the patient, and when they are confronted with a religious conflict of this nature, patients should not be hurt and stereotyped [1,4,9]. Therefore, clinicians are important to be sensitive to this diversity and know how to carefully navigate patients through it [1,4,9]. For a particular patient, especially a Hindu, his or her autonomy-ability to be involved in and self-determined views, religious, cultural, and ethical beliefs, desires, and choices may be more important than the treatment itself and the dentist's treating will [4,9].

Knowledge of different religious and cultural groups and their preferences regarding biologic mesh assists the physician in obtaining culturally sensitive informed consent for procedures involving xenografts or acellular allografts [4,6]. It is better for the physician to know the source of the product and cross-check its compatibility with the patient, rather than provoking unrest due to ignorance [9].

Even in routine treatment, if patients are lacking reasonable alternative medication, implants or bandages containing animal products could be allowed [2].

Patients are getting more and more appropriately informed and involved in their treatment individually [2,9]. They have the ethical right to refuse a specific treatment or product if it is against their unique cultural, philosophical, spiritual, or religious principles [3,4,9]. Patients with religious ideals may disagree with their dentist about what is the best treatment for their medical and dental care [1]. It is patients' right and autonomy to have the opportunity to participate in decision-making, with voluntary consent about their health care, the source, and alternative of the product if available [3,4,9].

Drugs and implants with human and animal-derived content are widely used in surgery and medicine, but health practitioners have rarely access to information regarding ingredients [2].

Implants are surgical products left in the body, like meshes used for hernia repair, heart valves, and spacers used in orthopedic surgery, that are more thoroughly labeled than drugs. The use of biological meshes is overall better integrated with less discomfort and postsurgical pain compared with their synthetic alternatives and they provide less risk of infection and foreign body reaction [2,12], especially for menopausal women, targeting their better quality of life.

The purpose of this article is to review the current literature and to report a case of a 60-year-old Hindu menopausal woman, partially edentulous with an exaggerated vomiting reaction, focusing on successful clinical management using a simple but effective table salt technique and proper fixed and removable prostheses design, as also to discuss how Hinduism and vomiting in menopausal women affect the dental treatment plan, especially prosthodontic and women's quality of life.

Biological products - A review

A religious perspective concerning the use of human and animal-derived drug ingredients, like bovine or porcine surgical products, has not thoroughly been investigated in current literature, especially among Hindu religious groups [1,2,9].

There are many sources of various commonly used biological products [9] and some of them are described in the following text.

a) Gelatin: Gelatin is widely used in medicine, particularly in shells of pharmaceutical gelatin capsules (50% - 80% contain gelatin) and surfactants [1-3,9,11,13-15] and it is known that it is of animal (bovine or porcine) origin (skin), derived as an irreversibly hydrolyzed form of collagen, which is a protein found in the skin and bones of cows and pigs [2,3,9,15-18].

b) A vegan-acceptable alternative to gelatin is hypromellose, but it is more expensive to produce [9].

c) Groups of naturally occurring proteins found in animals, especially in the flesh and connective tissues of mammals are collagens. Bovine and porcine collagens are commonly used sources [9].

d) Fibrin glue/sealant is a formulation of fibrinogen and thrombin, used to create a fibrin clot by acting as a tissue adhesive. Some of these fibrin sealants use bovine aprotinin [9].

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e) Chitin is the structural element in the exoskeleton of crustaceans (such as crabs and shrimp) and the cell walls of fungi. Deacetylation of chitin produces chitosan commercially [9].

Aprotinin, fibrinogen, collagen, and some types of chitosan are major sources of restrictions for Hindus [9].

f) A class of integral membrane proteins called hyaluronan synthases (three types: HAS1, HAS2 and HAS3) synthesize hyaluronan [9].

g) In a patented process producing a human-grade product, bacillus Subtilis has recently been genetically modified (GMO) to culture a proprietary formula to yield hyaluronans [9].

h) Alginic acid (algin or alginate) is an anionic polysaccharide that forms a viscous gum through binding water. Alginate hydrogel used in some cartilage products comes from alginate [9].

i) A gelatinous substance derived from a polysaccharide, agar or agar-agar, is a natural vegetable gelatin counterpart [9].

Grafts

In modern medicine, various graft materials such as natural (biological) and synthetic products are used routinely in many fields, e.g. anesthesiology, psychiatry, orthopedics, plastic, general and maxillofacial surgery [1,2,4,6,8,19-21].

Many procedures in maxillofacial surgery require the extensive use of bone graft materials to reconstruct, replace or recover soft or hard tissues (facilitation of optimum wound healing [4] and enhance bone volume (creation of a scaffold for bone formation) that have been resorbed or lost due to tooth loss [18], periodontal defects [17], systemic pathologies [16], or other conditions like trauma, infection, cyst, tumor, acquired or congenital bone defects, alveolar cleft reconstruction and sinus augmentations, etc [3,8]. Improvements in modern medicine have led to unprecedented growth in the availability of new biological products/materials that are usually animal (porcine, bovine) or human-derived tissues [1,2,6,8,19-21] and can be classified as autografts, allografts, xenografts and alloplastic grafts [8].

These biomaterials (medications and surgical implants) may be obtained from the patient's own body or other humans (human sources), animals (porcine, bovine sources), or can even be synthetically produced [1-3,6,8,9]. Despite these advances, there is little research regarding the patients' opinions about their willingness to use these biomaterials in their surgeries or the different bone graft materials available [3,8]. Bone grafts' source may be objectionable to the patient due to religious, cultural, and/or ethical beliefs and concerns [3,4,8]. Limited studies with the patient perception related to medical procedures involving organ transplants and soft tissue grafts have been conducted [3,20,22].

In dentistry, dental implants are used commonly in conjunction with bone grafts to enhance the bone's regenerative capacity after tooth loss, along with other periodontal procedures [4].

Bone grafting and substitutes in preparation for the placement of endosseous dental implants or other restorative dental therapy is one of the ethically undervalued and fastest-growing dental treatments [4].

In 2020, the global dental bone graft market size was valued at $663.2 million. It is estimated to grow at a compounding annual rate of 11.4% from 2021 through 2028 [4]. Increasing use of bone grafts in dental implant surgeries with high success rates is expected and is associated with a) the rise in the global geriatric population and edentulism and b) an increased prevalence of periodontal diseases. Consequently, there is a higher demand anticipation for bone substitute materials [4].

The dental research primarily focused on assessing the effectiveness of bone grafts rather than on patient perceptions is limited. On the basis of the origin of the donor tissue, bone grafts can be classified into 6 categories: autografts or autogenous grafts, allografts, xenografts, alloplastic or alloplastic materials (alloplastics), composite grafts, and synthetic regenerative bone grafts [3,4], but most frequently used in dentistry include the first 4 categories [3].

The literature which evaluated the effect of religious belief when selecting the different types of grafts used in oral and maxillofacial surgery is also very poor [8].

More details

a) Autografts

Autografts (autogenous/autologous bone grafts) are biological tissue grafts, taken from a part of a patient's own body (donor sites) and transplanted into another [3,8,23]. Traditionally, autogenous bone (autograft) is used as a gold standard in Randomized Clinical Trials (RCTs) related to bone formation in osseous defects [4,23-25]. These grafts possess histocompatible, non-immunogenic, osteogenic (cells that help reduce the bone healing time [3], osteoconductive and osteoinductive properties [3,8] and have the highest rates of acceptance among patients [4].

However, the use of the total tissue amount that can be transferred is limited. Additional surgery is required at the donor site (mostly preferred from the posterior mandible or retromolar region [4] (extraoral or intraoral) to harvest the autograft, and the quantity of the tissues that can be harvested are also limited by surgical risks and complications such as additional operating time, infection, scarring, blood loss (bleeding), chronic postoperative pain, hypersensitivity inflammation, infection, and donor site injury, morbidity deformity, and scarring [8].

b) Xenografts, allografts, alloplastic

The disadvantages of autografts have resulted in recent advancements and new surgical techniques in biomedical

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technology and medical sciences and in the availability of developing alternate graft biomaterials (such as xenografts, allografts, and alloplastic) that promote bone formation in osseous defects [8,23].

However, these 3 products (allografts, xenografts, and alloplastic grafts) are usually derived from bovine, porcine, equine [23] and human tissues. It is known that some religions such as Hinduism, Judaism, and Sikhs forbid the dietary use of substances from certain animal sources [1,2,6,8,9].

In comparison with autografts (tissues or cells from an individual being used in a different anatomical location within the same individual), xenografts are cells, tissues (bone), or organs taken from different biological species (animals), and they are generally obtained from porcine and bovine tissues transferred from one species to another species [3,8,23]. Due to their pathogenic transmission and immunological reaction, the organic contents of the xenografts are completely removed. The remaining inorganic xenograft component serves as a natural structural matrix for new bone formation [8], it is advantageous in the sense that it has osteoconductive properties [3,23,26] and preserves the original bone mineral structure. This is more complex than that of synthetic materials, i.e., alloplastics [3,26] eliminating the need for a second surgical site for bone harvesting [3,23]. Results from RCTs mentioned by Romanos, et al. [23] have shown that xenografts can successfully be used for alveolar ridge augmentation, ridge preservation, and surgical treatment of periodontitis and peri-implantitis [23].

The scientific community has discussed the topic of xenografts' ethical aspects [3,23]. Hinduism prohibits the use of porcine- and bovine-derived meat products and xenografts [2]. This is in contradiction to the Christian faith (Catholic and Evangelical) that permits the use of animal-derived xenografts in humans [2,23].

Allografts are the type of tissue (bone) grafts that are taken from one person (donor) and transplanted into another of the same species and are typically obtained from human cadavers and as a subsequence, subjected to processing [3,8]. The increased availability in a variety of sizes and shapes, and the avoidance of donor-site morbidity are allografts' main advantages. On the other hand, incomplete integration with the host tissue may appear, as allografts have no viable cells to offer osteogenic properties, they lack the osteogenic capacity of autografts and carry the risk of immune rejection or infectious agents [8]. Importantly, due to ethical and religious concerns, allografts are not available worldwide [3,27].

Alloplastic grafts are synthetic graft materials (hydroxyapatite, ceramic, calcium sulfate, or tricalcium phosphate [3,8], and alloplastic bone substitutes can be manufactured in various forms and there is no risk of disease transmission, they have a high abundance relative to natural materials, and a very low antigenicity [8].

Although there were no differences in the religious affiliations or sociodemographic variables in terms of the acceptance/refusal rates of the different bone grafts [3], the most preferred grafts were autologous/autogenous grafts (88.7%), alloplastic grafts (65%), bovine-derived xenografts (60.1%) among patients [3] in standardized surveys, towards the use of bone grafts in dental treatments [3,8,23] and allografts (53.2%) and porcine-derived xenografts (7.4%), elicited the highest refusal rates, especially refused because of religious reasons, beliefs and dietary restrictions affected on graft selection [3,8].

Therefore, although clinicians may be experienced with a specific type of bone graft, they must clarify the patient's opinions before a treatment plan [3].

Vegan-friendly dentistry might not be far off, as long as technology and innovation advance, although dentistry is not entirely devoid of animal-based products, efforts to be inclusive of the vegan community are underway [4]. Alternatives to the traditional porcine- or bovine-derived collagen membranes in patients who do not want animal-derived materials can be synthetic polyester membranes [4]. These membranes usually contain medical-grade aliphatic polyesters and their copolymers, such as polylactic glycolic acid (PLGA), are free of animal derivatives [4]. They are considered predictable and clinically safe for use in guided bone regeneration, with greater performance and controlled resorption rate comparable with that of traditional animal-derived collagen membranes [4].

The operators' preference and experience are usually the basic criteria for the selection of bone grafts (autograft, allograft, xenograft, and/or alloplastic materials) for osseous regeneration procedures [23,28]. The researcher's and clinicians' decision to use a particular type of bone grafting material may be influenced by published scientific evidence. Moreover, patients' and/or operators' opinions may be influenced by complications such as virus transmission, graft rejection, and the occurrence of zoonotic diseases in human beings mentioned in the literature [3,23,29].

Religion and graft acceptance

Lastly, there is a lack of specific literature regarding composite graft acceptance treatment. Nevertheless, it may be worth considering that patients who may have an objection toward any of the component materials may refuse the blended nature of composite grafts [4].

According to Eriksson, et al. [2], operators and also religious customs of patients may influence them to either decline or accept the use of bone grafts [23].

For instance, Hinduism conflicts with the use of products or implants derived from pigs and/or cows. The use of xenografts to enhance implant osseointegration and new bone formation in osseous defects is mentioned to be promising [23]; however, there are no studies that considered religious beliefs as a crucial inclusion criterion prior to the placement of bone grafts in patients. Acknowledging and respecting patients' religious beliefs is a moral and ethical obligation for scientists and healthcare providers, apart from improving the quality of life and providing the most beneficial treatment [23].

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In the survey-based study by Fernandez, et al. [3], significant differences were not observed in the acceptance/refusal rates for the different bone grafts (xenograft primarily) according to religious affiliation. These findings can be ascribed to the fact that the sample included only followers of the Christian religions (Catholic and Evangelical) who accepted the use of animal-derived products [2,3]. However, immigrant communities (such as individuals migrating from Middle-Eastern countries and South Asia) often continue to abide by their cultural values and original religious even after migrating to countries with varying spiritual and social standards [23].

It is hypothesized that followers of Hinduism seeking or residing medical therapies in countries such as the UK, the USA, and Australia, may deny participation and consent in RCTs using porcine- and/or bovine-derived products performed. Moreover, important legal and ethical issues may raise withholding information about graft composition from vulnerable participants [23].

The role of dentist/dental practitioner and prosthodontics

Dentists must streamline the available evidence appropriately and judge in an unbiased manner before presenting the treatment plan to the patient. Educating patients about the benefits and risks of graft materials will encourage a shared decision-making process between the dentist and the patient. Dental practitioners explain the advantages and disadvantages of each specific graft type. Factors such as evidence-based clinical performance, feasibility (specifically for autografts), anticipated treatment outcome, cost of the graft material, and operator's expertise must be considered carefully before practitioners recommend bone graft options [4].

The presentation of the current scientific data and evidence about possible and plausible treatment alternatives should be the practitioners' main role [3,4,28].

What is more, clinicians should listen to the patient's questions, preferences and opinions and take them into account before a decision regarding the "best alternative" treatment is made. Informed consent should be provided to many patients for procedures and treatments. This is a patient's legal and ethical right [30] and requires that the procedure must be described by the clinician, as also the material's type and origin to be used in the surgery [2-4].

The patient's refusal to undergo a treatment proposed by the practitioner may become an obstacle to a satisfactory clinician-patient relationship and prevent the treatment from proceeding [3,4].

Most dentists base their decisions primarily on their areas of expertise and experience [3]. It is their duty to know and take into consideration the biological (e.g. animal source/origin, drug and implant ingredients), mechanical, and structural properties of these materials while selecting graft material for any surgical procedure [3,4,8,9,28]. It is also crucial, in order to guide their Hindu and Sikh patients properly [2] while being aware of basic beliefs of various religions, or different religious sensitivities, to know their restrictions [1,2,4,9] and alternatives if available [2,3].

The final decision may depend on several factors, but it is necessary for the patient to be well informed [3,31] and agreement should be obtained [3,4,8,9,31] with the professional considering the costs, risks, and benefits of the type of bone graft to be used to achieve the final treatment outcome [3].

A study made by Fernández, et al. [3], determined that autologous bone (97%) and alloplastics (98%) were the most accepted bone grafts from an intraoral donor site, and xenografts and allografts elicited the highest refusal rates among the surveyed patients [3,8]. Interestingly, discomfort, the fear of pain, possible negative effects on other parts of the body, or religious reasons were the patients' main reasons for refusing autologous bone grafts [3].

Similarly, according to religious affiliation, significant differences were not observed in the acceptance/refusal rates for the different bone grafts [3]. The Gungormus, et al. (Islam) study [8], observed that the most preferred grafts were autologous grafts (88.7%), alloplastic grafts (65%), bovine-derived xenografts (60.1%), allografts (53.2%) and porcine-derived xenografts (7.4%), respectively. Additionally, it was observed that the main allograft rejection's reasons were the belief that it was wrong to use bone from another human being (17%), fear of possible disease transmission (15%), preferences (3%), and religious reasons (1%). The main reason for xenograft rejection was the belief that it was wrong to use animals for human benefit and the fear of possible disease transmission. However, the Fernández, et al. study was conducted on a population predominated by the Evangelicals and Catholics, known that the use of grafts derived from animals and humans is allowed by both. In this study, it was determined that the least preferred grafts were porcine-derived xenografts and the most preferred grafts were autogenous. The porcine-derived xenografts were especially refused because of religious belief and dietary reasons and these restrictions affected graft selection [8].

In summary, for many patients who require dental implants for either aesthetic or functional reasons, bone grafts have the possibility to resolve the problems of insufficient height or thickness of their jawbone. The "gold standard" for bone regeneration is currently considered autologous bone, due to its osteoinduction, osteoconduction, and osteogenesis-inducing properties [3]. However, autologous bone grafts occasionally have significant drawbacks, such as the need for a second surgery, increased postoperative morbidity, and the lack of sufficient bone mass at the donor site [26]. Consequently, other scientific therapeutic options have been developed, such as alloplastic grafts (synthetic bone substitutes), a processed bone from different individuals of the same species (allografts), and processed bone from species other than that receiving the graft (xenografts) [3]. Unfortunately, some controversial issues are reported regarding allografts in literature, related to possible virus transmission, graft rejection, and other ethical concerns [29,32]. Similarly, xenografts may produce zoonotic

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disease sometimes [32]. These opinions could determine the final treatment, as these data may influence the opinions of patients and clinicians [3], especially for populations with religious restrictions.

Clinical report/Case presentation

A Hindu 60-year-old menopausal woman presented to our dental clinic for replacement of her missing teeth, in a "dental fear" state and expressed categorically her anxiety about the problems and restrictions her religion could arise during her dental treatment. This was the motivation to search the scientific literature concerning prosthodontic treatment, especially in menopausal women which are a specific population [33], dental implants and bone grafts in relation to patients' religion, especially Hindus, something not so common for the Greek reality, as the main religion in Greece is Christianity. The patient's main complaint was the impairment of her chewing efficiency due to a lack of teeth. She also reported discomfort when large items, such as a toothbrush or dental mirror were in her mouth because of her gag reflex. As a result, the patient rarely made visits to the dentist and received only conservative periodontal and prosthodontic treatment and extractions as emergency treatment.

After having discussed the case with her gynecologist who encouraged her to proceed and after a thorough consultation and because there were no contraindications concerning medication, X-rays, or prosthodontic procedures, she finally decided to address her esthetic and functional oral problems. Her quality of life as a menopausal woman was poor due to difficulties in eating [33]. Her medical history was free of any disease and she did not receive medications, after being subjected to a routine evaluation program according to menopausal examinations [34].

Dental clinical examination revealed a lack of posterior support due to multiple missing teeth in both arches, poor oral hygiene, and a high caries rate (Figures 1,2). Several nonrestorable roots were present in the upper jaw. Because of her age and her denial of having dental implants and bone grafts because of her religion, the classic, conservative prosthodontic treatment was decided, after a thorough discussion with the patient, the periodontist, and the gynecologist. The patient was diagnosed with generalized moderate periodontitis by the referring periodontist. Dental panoramic radiography and periapical X-rays were performed only when needed during the dental clinical stages by taking always all the protective measures. The nonrestorable teeth were extracted. Initial periodontal therapy and CAMBRA (caries management by risk assessment) protocol were used [35]. Following initial therapy, the remaining teeth were the two maxillary lateral incisors, the canine, the first premolar, and the first molar on the right side. No temporomandibular disorder signs or symptoms were observed during the clinical examination.

Two conventional single crowns/fixed partial dentures (FPD) and a maxillary removable partial denture (RPD) as also a mandibular complete denture were planned as a treatment to restore occlusion and support. The patient was highly anxious

Figure 1: Patient's frontal view.

Figure 2: Initial frontal view before prosthodontic therapy.

due to a previous bad experience when she did not complete the treatment elsewhere. At the start of definitive prosthodontic treatment, a detailed medical and dental history was recorded, and a detailed discussion was made concerning religion and the proposed treatment. Trigger zones were identified with the help of a ball burnisher. An immediate gag reflex was provoked as the burnisher reached the junction of the hard and soft palate and as the mirror or fingers touched the tongue. The use of table salt as an immediate behavioral management technique was advocated to improve patients' tolerance during appointments and impression-taking [36-38]. The patient was instructed to extend her tongue and apply salt to the tip of her tongue for approximately 5 seconds.

Impression trays were carefully and gently inserted, and contact with trigger zones was avoided. Preliminary diagnostic impressions were performed in order to construct, with the resulting casts, the provisional fixed restorations- using stock trays and fast-set irreversible hydrocolloid impression material (Kromopan; Kromopan USA Inc., Morton Grove, IL) in a thick mix to minimize time and posterior flow. The resulting diagnostic casts were fabricated using type III dental stone and were surveyed and tripoded to design the RPDs. Mouth preparation including tooth preparation and build-ups, re-contouring, guide planes, and occlusal rest preparations were performed. Custom trays were fabricated without a palatal coverage in order to minimize gag-reflex using light-polymerized resin material (Triad Trutray; Dentsply Sirona, York, PA). Border molding was performed using impression compound (Green Stick; Kerr Corp., Orange, CA) and polyvinyl siloxane (PVS) impression material regular set (base and catalyst), and light-bodied consistency (Aquasil Ultra+; Dentsply Caulk, Milford, DE) was used for the final impressions. The impression materials and techniques that are used in order to construct dental prostheses with passive fit are paramount [39]. Definitive casts were fabricated in type IV

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dental stone (Silky Rock; Whip Mix Corp., Louisville, KY), and the FPDs and RPD metal frameworks were waxed, sprued, and cast in metal alloys (GC Corp., Japan) on the dies.

The maxillary RPD used a U-shaped palatal major connector, wrought wire clasps as retainers, engaging in buccal undercuts on the maxillary crowned lateral incisors, and definitive occlusal rests on the crowned maxillary first molar and second premolar pontic (Figure 3). Metal frameworks were tried in, in order to be sure about their passive fit and the occlusal alignment, by using table salt to minimize gag reflex, and physiologic adjustment was done on the abutment teeth to minimize stress. An occlusal registration was performed using PVS material (Blu-Mousse; Parkell Inc, Edgewood, NY). Porcelain fused to metal was used for crowns processing in compliance with the manufacturer's instructions. Try-in was performed, and occlusion and esthetics were verified prior to crown processing.

The crowns were fitted and cemented with a resin-reinforced, glass ionomer luting cement (GC Fuji Plus®, GC Corp., Japan). Artificial tooth selection (Trubyte Bioblend; Dentsply Sirona) and tooth set-up were performed. Try-in was performed, and occlusion and esthetics were verified. Heat-polymerizing acrylic resin (Lucitone 199; Dentsply Sirona) was used for RPD processing according to the manufacturer's instructions. The crowns were fitted and cemented and the RPD was fitted and inserted. The crowns' and removable partial denture's design resulted in comfort and the Hindu menopausal woman was instructed in prostheses' hygiene. A schedule of periodic preservation appointments was set to re-evaluate the patient (Figures 4,5). The maxillary RPD's design avoided proximity to trigger zones, resulting in comfort and easy treatment acceptance. A schedule of periodic maintenance appointments was set to re-evaluate patient compliance.

The above-described case was the motivation to search the corresponding medical and dental scientific literature concerning prosthodontic therapy, either conservative, without dental implants and grafts, or with implants and dental prostheses in relation to Hinduism, and how religion may influence the final prosthodontic treatment. A limited number of publications have been reported in the field of religion and health academic literature [5,7]. A first bibliometric analysis was performed in the health literature related to Dharmic religions, Buddhism, Hinduism, and Sikhism. The most used keywords in the field of Hinduism and health were ''Hinduism'' and ''religion'' according to a detailed keyword analysis. Countries

Figure 3: Maxillary RPD framework.

Figure 4: Definitive prostheses - occlusal view. Maxillary FPD and Crowns.

Figure 5: Definitive prostheses, frontal view.

such as India, Taiwan, Thailand, and Singapore were found to be included in the most productive countries list in the health and religion field related to Dharmic religions [5].

Discussion

The scientific community faces patients of different religions, faiths, traditions, and beliefs, because of the shift of population globally, and has to adjust socially to new conditions. Personalized medicine arises from pharmacogenomics and its development poses great challenges to clinical practice. It is based on the premise: "The right treatment for the right patient at the right time" [28,40]. Personalized medicine attempts to direct the choice of medications, the most appropriate medical interventions, and preventive measures to patients, related to data from differing fields whose quantity can be determined, by their genetic, psychosocial, clinical, or other. The specification of individual risks is even enabled by this type of medicine [28,41]. Because of restrictions and because of the possible need to be treated prosthodontically, the patients have to undergo suitable for them therapy, without this being against their religion. If there is an emergency, though, the ideal dental therapy, even against religion, must be followed.

Greece comprises a multicultural society. Therefore, it is necessary to consider the religious beliefs of all patients and establish ethical expectations from dental providers that obligate a moral commitment towards their patients and oral health care teams' welfare, as the American Dental Association Principles of Ethics and Code of Professional Conduct proposes [4]. As part of a dental practitioner's care duty, the informed consent process should include a discussion about animal-derived surgical implants to avoid litigation and possible religious distress. A better understanding of religious views would enhance the medical care of Hindus [1].

In Hinduism since 200 AD, the cow is a sacred and auspicious animal because of cultural and agricultural reasons; therefore,

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it is considered a sin to kill it [1,2,4,9,14]. Unlike the pig, which is considered unclean to Jewish and Muslims, contact with bovine products is considered purifying in the Hindu religion [1,4] and Hindu patients feel offended if a product used, comes from cows [9,10].

The use of any dressings, drugs, or implants, if they contain bovine or porcine material, is not permitted by Vaishnavism, the major branch of Hinduism [2].

It is understood that people living in different countries have different faith, and different generations decide on different rules/beliefs, and follow different religious leaders. The information provided by one leader may not be acceptable to another one of the same faith. What is more, all major religions have subdivisions with some variations in their beliefs. There may be different opinions in a family itself among the various generations of the same belief. Nowadays, in a modern multicultural society, there is also a wide cultural and faith mixing. Hence, the way they interpret their religion can also vary [9].

Religious leaders and regional dental licensing boards generally advocate the practice of obtaining the tissue donor's informed consent when considering the use of human-derived tissue [4].

Hindu leaders advise against the use of bovine bone in dental surgery and the first option suggested should be alternative, non-animal-derived products [1,6,9,14].

According to the chairman of ''Hindu Council of Australia'', the Hindu community "will not undergo surgery with surgical implants derived from bovine materials because this would necessitate the killing of cows to produce the surgical product" [1,6,9].

The opinions of religious leaders are not universal and must not be overgeneralized, because people of the same religion may display a spectrum of views concerning the use of human and animal tissues in dental treatment [4] and patient preferences may vary among geographic locations depending on the cultural and religious population's diversity [4].

Interestingly, the use of animal-derived products and medications is accepted by all religions, in case of an emergency or starvation situation, even for both Sikhs and Hindus, and only if there are no alternatives available or if alternatives are inadequate [1-3,14] because they would be the only way to conserve and to prolong life, although it may cause conflicts with religious or personal beliefs needed to be considered before the surgery [1-3,14].

Christians and other religions (including Jehovah's Witnesses), accept the use of all human and animal-derived products (dressings, drugs, and implants) and are only allowed when donor's consent is given [2,10,15,20,42]. Adappa, et al. [13] found that 25% of clinicians routinely discussed with patients what ingredients are included in medications. Many clinicians do not incorporate religious sensitivities into their practice or do not have enough knowledge about prescribing products and religious prohibitions [1,13]. It is unusual to obtain consent from patients belonging to cultural backgrounds or various religions who are to become recipients of biological products [1,20]. Medicine involves respecting patients' autonomy and giving them the opportunity to make voluntary and informed decisions about their health care. To practice mindfully and with cultural competency, dental providers should be encouraged to discuss surgical implants' bone grafts' source with patients and obtain proper informed consent for treatment, regarding, considering, understanding, and respecting patients' priorities religious, cultural, ethical beliefs and values and avoid conflicts [1,4].

The failure to inform patients of what constitutes a product is an autonomy violation. Article 9 of the Human Rights Act states that "everyone has the right to manifest his religion or belief, in worship, teaching, practice, and observance." [1,4,20]. Religious patients may not accept an animal-derived surgical product and may experience distress because it may breach their personal opinions of how they view their religion and can have severe consequences, such as the loss of trust in the treating dentist or in the profession and potential treatment discontinuation [1,4].

Therefore, dental practitioners are expected to adhere to the principles of beneficence, nonmaleficence, justice, autonomy, and veracity to treat their patients ethically [4] and they must remember that patients decide finally, concerning the procedures to be or not to be performed on their bodies based on their religious interpretations [1,4].

Dentists must not make assumptions about patients' preferences and religious viewpoints, affiliations, or cultural practices, because many have different faith commitments and convictions [1,4]. The American Dental Association Commission on Dental Accreditation standards require dental education programs that implement and develop educational processes encouraging a patient-centered, comprehensive approach to oral health care delivery and "ensure that patient preferences, and their economic, social, emotional, physical and cognitive circumstances are sensitively taken into account." [4].

Because we live in a multicultural society in which religion is constantly shaping the modern world, there is a need for dental practitioners to be aware of these religious issues, particularly if dentists ignore religious ideals and neglect to explain the constituents of biological products. Then, there may be serious consequences, including patient distress and litigation [1].

A potential disagreement during treatment planning with a chance for resolution would be far better than the dentist facing a potential predicament later, such as patients' dissatisfaction with performed treatment after the irreversible use of a material that the patient is not comfortable receiving, loss of trust in the dentist-patient relationship and even legal ramifications [4].

Religious leaders and dental practitioners should collaborate and share evidence to find acceptable compromises in cases in which suitable treatments or treatment regimens do

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not exist and explain the rationales behind selecting a clinical scenario as the superior or best choice [1,4]. Additionally, religious leaders may need to be educated about medical issues to help raise awareness about the use of animal products in surgery. Previous experience has shown that religious leaders are, in general, supportive of treatment using components of forbidden animals as long as there are no alternatives and the lack of treatment could otherwise lead to death [1,14].

Xenotransplantation's prevalence is expected to increase in the future, especially because the pig is considered the most probable species for use in organ transplantation, as its anatomy is similar to that of humans [1,43].

Little is known about what dentists do when they face a religious conflict of this nature and how they navigate through it [1,9]. A previous study in the United Kingdom demonstrated physicians' lack of basic knowledge concerning the source material of many biologic products [6,20].

Clear human values, ethics, and general guidelines from professional bodies and licensing authorities are needed to help dental practitioners navigate religious conflicts and in taking decisions [1,4,9]. This is important because a big part of the female population that needs dental, mainly prosthodontic, treatment, is the population of menopausal women and we have the obligation to provide them the best quality of life concerning their psychosocial status and their ability in eating.

Conclusion

In conclusion, because of the shift of population globally, the scientific community faces patients of different religions, faiths, traditions, and beliefs, and has to adjust socially to new conditions. Women in the menopausal period are the main part of this population. With the knowledge of the specific religious characteristics and restrictions and the possible alternative therapies, it is widely accepted that scientific multidisciplinary cooperation is very important between the involved health practitioners, gynecologists, dental providers, and patients. Clinicians and dental practitioners need to have the knowledge to be sensitive to a patient's individual religious beliefs, humanitarian, and personal values, and cultural background. Many procedures and treatments require that clinicians inform their patients, describe to them the procedure, the origin (source), and type of materials, products, and components (composition and rationale) to be used in the surgery, and offer them an alternative if available, within a treatment plan. It is a surgeon's instinct to preserve and save a life, as also to provide the best quality of life, especially to menopausal women. If the materials must be used, then they should be thoroughly discussed with the patients in order to agree.

Hindus and Sikhs, do not approve of some animal-derived products if there are other alternatives, but various products that can be compatible with Hindus and Christians are identified, based on the information given in catalogs. However, in case of emergency, if there are no other alternatives available, if the treatment is life-saving, and if improvement of the quality of life is needed, then all religions approve all treatment modalities (human and animal-derived products) regardless of origin. The dental profession can be advanced and the dental patient experience can be enhanced when we adapt to the patient's needs and desires and the selection is on a scientific basis without any bias. Because of restrictions and because of the possible need to be treated prosthodontically, the patients have to undergo suitable for them therapy, without this being against their religion. If there is an emergency, though, the ideal dental therapy, even against religion, must be followed.

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