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Considerations for Orthodontic Treatment During Pregnancy: An Update

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ABSTRACT

Pregnancy is associated with the various physiological and hormonal changes in females. Orthodontic as well as any dental treatment should not be denied during pregnancy, perhaps some necessary precautions should be taken while treating a pregnant patient. This review article focuses on the hormonal changes and the prescribed drugs taken during pregnancy that affects the orthodontic treatment, the importance of communication and motivation, the precautions to be taken and the orthodontic considerations and management for the pregnant patients. This electronic search was undertaken through Google scholar and PubMed databases by utilizing the appropriate keywords. Literature was extensively reviewed to get information regarding dental and orthodontic treatment during pregnancy. Finally, the overall findings were summarized and presented in the following article. Based on the researched reviews, the orthodontists as well as other health care professionals need to realize that the orthodontic treatment is not a contraindication during pregnancy and can be performed successfully during this period by taking certain precautions. A good communication between the patient and the orthodontist must be established for the successful completion of the orthodontic treatment.

Key Words: Pregnancy, Orthodontic tooth movement, Hormonal changes, Teratogens, Drugs, Periodontal health

INTRODUCTION

Recently there is a sharp rise in the number of adults especially females who have been seeking orthodontic treatment primarily for esthetics. Hence, orthodontists come across the female patients who undergo pregnancy during the mid-treatment which require special considerations during the orthodontic treatment. The following article highlights the hormonal changes and the prescribed drugs taken during pregnancy that affects the orthodontic treatment, the importance of communication and motivation, the precautions to be taken and the orthodontic considerations and management for the pregnant patients.

ORTHODONTIC IMPLICATIONS OF PERIODONTAL HEALTH DURING PREGNANCY

During pregnancy, the fluctuations in the hormones along with the various modifications in the immune system, have

an impact on periodontal health. “Granuloma gravidarum” or “pregnancy tumour” develops in 5% of pregnancies. The gingival inflammation caused by subclinical hormonal alterations and plaque accumulation leads to gingivitis.^{1,2} Fixed orthodontic treatment leads to several plaques retaining areas which demand rigorous oral hygiene measures. Moreover, various researches have shown the association between the diseases of the periodontium and higher risk of premature low birth weight babies.^{3,4}

HORMONAL CHANGES DURING PREGNANCY AFFECTING THE ORTHODONTIC TOOTH MOVEMENT

There are certain hormones such as progesterone, estrogen and relaxin which show increased level during pregnancy which need to consider orthodontic treatment.

Progesterone

The range of progesterone levels are 100-200 ng/ml and the amount produced by placenta is about 250 mg/day.^{5,6} There is

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an association between the increased levels of progesterone and the presence of increased prostaglandin E2 in the gingival sulcus.⁷ He et al demonstrated the role of progesterone in the formation of alveolar bone which signifies the safety for pregnant patients undergoing the orthodontic treatment.⁸ Various studies mentioned that the long-term administration of progesterone (at ninth week) in rabbits could reduce the rate of orthodontic tooth movement (OTM).^{9,10}

Estrogen

Estrogen level increases steadily during pregnancy and reaches a maximum during the third trimester. As estrogen has effects on RANKL/RANK/osteoprotegerin system and it reduces the production of pro-resorptive cytokines along with the reduction in the number of osteoclasts, therefore, it inhibits the resorption of bone and hence decreases the OTM. Increased estrogen and progesterone level during pregnancy might reduce OTM.¹¹

Relaxin

Relaxin is released just before childbirth to loosen the pubic symphysis thus facilitating the parturition. It is documented that relaxin enhances the turnover for the fibrous connective tissues and can increase the rate of OTM by its effect on the tissues of the periodontal ligament.¹²

DRUGS TAKEN DURING PREGNANCY AFFECTING THE ORTHODONTIC TOOTH MOVEMENT

Special considerations should be undertaken while treating pregnant patients for avoiding any potential teratogenic effects due to various drugs. Due to organogenesis occurring during the first trimester, the fetus is more susceptible to teratogenesis during this period. The classification of drugs put forward by United States Food and Drug Administration based on risks they are posing to the fetus. Drugs which are categorized as safe were put under Category A & B, drugs whose benefits outweigh the risks they are posing to the fetus are categorized under Category C, the drugs that should be avoided during exceptional situations are under Category D and the drugs whose use are contraindicated during pregnancy are under Category X.

NSAID

NSAIDs suppress the production of prostanoids by inhibiting Cyclo-oxygenase 1 and 2 activity. Various experimental studies demonstrated that the OTM is reduced by the effects of nonsteroidal anti-inflammatory drugs (NSAIDs) due to a reduction in the number of osteoclasts, as prostaglandins are involved in differentiation or stimulation of osteoclasts.^{13,14}

The effects of various groups of NSAIDs and their effects on OTM are described below:

Salicylates

Experimental studies on rats has shown that the rate of movement of lateral incisor on the application of 35 centinewtons (CN) of force significantly decreased after administration of 100 mg per kilogram acetylsalicylic acid two times a day.¹⁵ It was found that local injections of 17.5 to 35 mg per kilogram per day of copper salicylate caused the significant decrease in mesial movement of the molar in rats on the application of 50 or 100 cN of force.¹⁶

Arylalkanoic acids

Studies on rats have revealed the significant short-lasting inhibitory effect on the mesial movement of the molars on the application of 40 CN of force after administration of 4 mg per kilogram of indomethacin. Studies done for examining the effects of diclofenac has also demonstrated the mesial tipping of first molars after application of 50 or 100 cN of force in rats.^{17,18}

Arylpropionic acids

Studies revealed the reduction in OTM, after administering 30 mg per kg of ibuprofen twice a day. However, on administering the low dosage of 10 mg per kilogram per day of flurbiprofen, no inhibitory effect was noticed on the mesial movement of first molars in rabbit with 100 CN of the force application.¹⁵

Coxibs

The effect of local injection of 1 mg per kilogram of rofecoxib was studied in rats at 1 and 3 days and it was seen that the force of 50 or 100 cN induces the mesial movement of first molars but no OTM was observed when the amount of force application was below 50 cN.¹⁸

Paracetamol

The study was conducted to evaluate the effect of 500 mg per kg per day of paracetamol on OTM in rabbits and no effect was observed when a force of 100 CN was applied.¹⁹ Another similar study done after administering 400 mg per kg per day of paracetamol in rats for 10 days, with a force of 35 CN and no effect was observed.¹⁵ Therefore, it was suggested that paracetamol can be given as an analgesic during pregnancy for the patients undergoing orthodontic treatment as it doesn't cause any adverse effect on OTM.

Corticosteroids

Glucocorticoids inhibit the synthesis of prostaglandins and leukotrienes by indirectly blocking the phospholipase A2 and suppressing the synthesis of COX-1 and COX-2. An experimental study was done to evaluate the mesial movement of first molars after administration of 1 mg per kg per day prednisolone in rats for an induction period of 12 days, followed by 12 days of the experimental period during which 30

cN of force was applied. No effect on the rate of OTM was observed in this study.²⁰ Similar study was done to evaluate the effects of 8 mg per kg per day of methylprednisolone that revealed an increased rate of OTM.²¹

Vitamine D3

1,25 dihydroxycholecalciferol regulates calcium and phosphate serum levels by assisting their intestinal absorption and reabsorption in kidneys, deposition of bone and by inhibiting the release of parathormone. Low supplemental administration of Vitamin D3 stimulates the bone resorption by upregulating the RANKL expression in osteoblasts that leads to the differentiation of osteoclasts through RANK/RANKL system.²² It has been proven by the experimental studies that the rate of OTM is stimulated by Vitamin D3 in a dose-dependent manner.²³

Diatary Calcium

In an experimental study, the low and high calcium was given to the dogs for 10 weeks to study the effects of OTM and thereafter 100 cN of force was applied for 12 weeks. The group consists of a low calcium diet showed a higher rate of OTM from 8 weeks as compared to the group with a high calcium diet.²⁴ This data supported the earlier studies conducted on bone turnover revealing that the number of osteoclasts and osteoblasts were increased by the intake of low calcium diet in the rats.²⁵

Bisphosphonates

Bisphosphonates inhibit the aggregation of hydroxyapatite, dissolution and crystal formation due to their strong affinity to the solid-phase surface of calcium phosphate. They increase the intracellular calcium levels in osteoclasts thereby reduces the activity of osteoclasts, preventing the hematopoietic precursors for the development of osteoclasts and production of an osteoclast inhibitory factor. The reduction in the rate of OTM was revealed through various studies after the intake of topical or systemic bisphosphonates.^{26,27}

PHYSIOLOGICAL XEROSTOMIA DURING PREGNANCY & ITS ORTHODONTIC CONSIDERATIONS

Physiological xerostomia is frequently encountered during pregnancy due to the adverse effects of various drugs like anti-histamines which increases the risk for caries due to salivary dysfunction. Topical fluoride application and artificial saliva can be recommended in case of severe xerostomia.²⁸

BRUXISM DURING PREGNANCY & ITS ORTHODONTIC CONSIDERATIONS:

Bruxism is a common finding during pregnancy due to various physiological changes occurring in women's body that induce the stress resulting in habitual clenching or grinding of the teeth during this period. Various deleterious effects on

teeth and their supporting structures occur due to bruxism as it causes excessive attrition of teeth and damages periodontal tissues and temporomandibular joints.²⁹ Alongwith the breakages, the most common complaint in patients with bruxism is the tenderness in the temporomandibular joint. Various treatment modalities for bruxism are the stress reduction therapy, alteration of sleep positioning, drug therapy, biofeedback training, physical therapy and deprogramming appliances.

CHANGES IN THE SALIVARY COMPOSITION DURING LATE PREGNANCY & ITS ORTHODONTIC CONSIDERATIONS

During late pregnancy, various changes can be observed in the salivary composition that temporarily predisposes to dental erosion and dental caries.³⁰ Therefore, it is necessary for the orthodontist to motivate the patient for taking rigorous oral hygiene measures.

EATING HABITS DURING PREGNANCY AND ITS ORTHODONTIC EFFECTS

Some women experience unusual cravings for food during their pregnancy, which may increase the risk of tooth decay and caries.³⁰ Therefore, the patients undergoing orthodontic treatment should be counselled regarding the diet and care must be taken so that the overall health of the patient and the fetus is not affected as a result of any nutritional deficiencies.

ORTHODONTIC CONSIDERATIONS WHILE TREATING A PREGNANT PATIENT

Oral hygiene maintenance

Since gingival inflammation is a common occurrence during pregnancy due to various hormonal changes, vigorous oral hygiene procedures, interdental cleaning aids, constant reinforcement, monitoring the patients periodically and the frequent discussions with the patient are crucial to maintaining the oral health during the orthodontic therapy. Various researches have shown the association between the diseases of the periodontium and higher risk of premature low birth weight babies along with the pre-eclampsia during pregnancy.^{3,4}

Timing of Treatment

As most of the patients during pregnancy feel nausea during morning time therefore orthodontists should avoid giving the appointments during the morning hours to avoid vomiting episodes during the appointments. The appointments should be kept for a shorter duration to avoid any discomfort to the patients. As organogenesis is completed by the first trimester, therefore it is preferred to conduct the routine procedures during the second and third trimester.³¹

It is recommended to postpone the extensive elective procedures until the delivery.

Posture of the patient

Pregnant patients often experience the postural hypotension due to various cardiovascular changes that include lightheadedness, weakness, sweating, pallor, unconsciousness and convulsions. Therefore, patients should be advised to change their positions slowly and/or lean towards the left side while in the dental chair.³² The supine position leads to the development of “supine hypotensive syndrome” that causes a decrease in the cardiac output which results in hypotension, syncope and the decrease in uteroplacental perfusion. The ideal position during pregnancy is the left lateral decubitus position with the right buttock and hip elevated by 15°.³³

Radiographic imaging

Radiographs should only be taken in cases of utmost importance during pregnancy. Dental radiography should preferably be taken during the second trimester and the patients should be asked to wear lead aprons.^{31,34} The dose of the radiograph and the gestational timing are the important factors. According to the American Dental Association, all precautions are recommended to minimize the risk of radiation during pregnancy. Various animal and human studies have supported the data that there is no increase in the gross congenital anomaly that can occur due to radiographic exposure of less than 0.05 to 0.1Gy during pregnancy and the amount of radiation used in dentistry are within this threshold range.

Simple and realistic approach

It is important to plan a simple and realistic treatment for pregnant patients. If the patient is willing to undergo orthodontic therapy primarily for frontal aesthetics, it should be established from the beginning and the limited treatment should only be performed. If it is possible to treat the patient by the removable appliances, then it should be preferred over the fixed appliances as with removable appliances it is easy to maintain the oral hygiene as well as the health of gingival tissues. Patient's cooperation is important while delivering a removable appliance and therefore patient's selection along with the proper counselling is a crucial component especially during the period of pregnancy.

Prefer non-extraction over-extraction

Preference should always be given to the non-extraction approach over-extraction if possible in pregnant patients as the treatment time is reduced by taking a former approach, but it is important that the diagnosis and treatment planning is proper and the treatment outcome should neither worsen the patient's profile nor should cause any other harm to the patient.

Avoid invasive procedures

The invasive procedures such as the placement of temporary anchorage devices and any kind of surgical procedures should be avoided during pregnancy.

Force

Light and continuous force should be applied as during pregnancy the periodontium is more susceptible to breakdown with heavy forces.

Steel ligatures versus elastomeric modules:

Steel ligatures are preferred over elastomeric modules because elastomeric modules are a source of plaque accumulation and therefore less hygienic as compared to the steel ligatures.³⁵

Medications:

Since various drugs can affect the maternal cardiorespiratory functions or can have a teratogenic effect by crossing the placenta, therefore it is essential to consult the gynaecologist before prescribing any medications.³¹

Diet

Proper maintenance of balanced diet along with the restrictions of certain food during orthodontic treatment should be balanced by proper communication as well as taking in account the various nutritional deficiencies and the hormonal alterations that can occur during pregnancy. The intake of healthy snacks and plenty of water is recommended for pregnant patients one hour before the appointments to avoid nausea during dental procedures.

Co-ordination with gynaecologist

It is beneficial to take the gynaecological opinion for pregnant patients if any known complications are expected. As various drugs can affect the rate of OTM, therefore it is important to know the history of medications that are advised to the patients by the gynaecologists.

CONCLUSION

The orthodontists, as well as other health care professionals, need to realize that the orthodontic treatment is not a contraindication during the pregnancy and can be performed successfully during this period by taking certain precautions and in collaboration with the gynaecologist. Good communication between the patient and the orthodontist must be established for the successful completion of the orthodontic treatment. The detailed history of the patient along with the proper examination of the oral cavity and thorough assessment of patient's expectations as well as the compliance enables the orthodontists to aim for the successful orthodontic therapy in a pregnant patient.

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2. Acquisition of data: Dr. Dinesh Kumar Bagga
3. Analysis and interpretation of data: Dr. Madhurima Nanda
4. Drafting of the manuscript: Dr. Aartika Singh
5. Critical revision: Dr. Prashant Kumar Shahi, Dr. Poonam Agrawal

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