



International Journal of Applied Dental Sciences

ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2015; 1(3): 15-19
© 2015 IJADS
www.oraljournal.com
Received: 11-04-2015
Accepted: 13-05-2015

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Pregnancy and Orthodontics: The Interrelation

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Abstract

Pregnancy is one of the most wonderful phases in a woman's life. There is no any health reason why a pregnant woman cannot wear braces. Pregnancy may reduce velocity of Orthodontic Tooth Movement and subsequently increase treatment period, but patients should not be worried about get in trouble during pregnancy and orthodontic treatment, because the duration of orthodontic treatment is often more than pregnancy period. This article mainly emphasize on the collective effect of pregnancy related hormonal changes, drugs used in pregnancy, changing habits during pregnancy and certain condition during pregnancy like gingivitis on the orthodontic tooth movement.

Keywords: Orthodontics, Pregnancy, Gingivitis, Hormones, Drugs

1. Introduction

Pregnancy is the most life altering experience in a woman's life. It is a common saying "when you look good, you feel good". It's a fact that wearing braces and correcting your smile can be a hugely life altering experience too! It is important for the pregnant woman to not only look good, but also to feel good inside out as this will have a whole lot of impact on her well-being as well as that of her unborn child. Getting your smile fixed and enhancing your appearance can also do much of the same things.

It's a fact the people are naturally drawn toward pleasant faces. An enhanced appearance will also change the way you relate to others by increasing your self-confidence and helping you converse, smile and laugh with ease. If you're taking orthodontic treatment, and suddenly find out that you are pregnant, there is no need to be tensed. There is no reason why you need to postpone your orthodontic treatment till after your delivery.

The main aim of this article is to emphasis the effects of hormonal changes in Orthodontic treatment, patient education, oral hygiene maintenance and preventive and treatment strategies for the management of gingival health in orthodontic patients during pregnancy.

History taking of the pregnant lady

Like any other form of dental care, before starting orthodontic therapy, a thorough and detailed medical history is critical especially when patient is pregnant. However, in case of pregnancy, it is important to get the opinion of the gynaecologist if any known complications are to be expected.

A history of current medications is also valuable because various drugs have oral side-effects and may influence the course of the orthodontic therapy. Drugs such as non-steroidal anti-inflammatory drugs, hormone supplements and vitamin D metabolites could probably cause a reduction in tooth movement during orthodontic therapy. Any previous medical conditions such as pregnancy induced diabetes mellitus or previous pregnancy complications are important to know in advance before starting orthodontic treatment^[1, 2].

A complete dental history provides the orthodontist knowledge about the patient's attitude towards dental-care and patient's priorities. It is important that the orthodontists must be more active and capable of diagnosing gingival and periodontal problems. If the patient already has signs such as gingival inflammation and poor oral hygiene, it may be wise to start orthodontic therapy after the pregnancy because due to braces the maintenance of oral hygiene becomes difficult. It is especially important to take into account the hormonal and physiological changes that will be anticipated during the course of pregnancy.

Patient's perception of their own health is considered to be an important aspect of their

psychosocial make up and potential compliance. It is important for the orthodontist to know if the patient is self-motivated and enthusiastic about receiving orthodontic treatment or they are forced by someone else for it.

Certain factors that need to be kept in mind before going ahead with braces in pregnant women are:

1. Pregnancy induced gingivitis and periodontitis.
2. Hormonal changes affect tooth movement.
3. Effect of various drugs in pregnancy and tooth movement.
4. Eating habit and craving during pregnancy and its effect on orthodontic treatment.

1) Orthodontic consideration for gingival health during pregnancy

Gingivitis is caused by several factors they may be local or systemic factors. Among systemic factors, the role of hormonal changes during pregnancy is well-established. Although, the presence of fixed orthodontic appliances alone may not cause gingivitis, factors like pregnancy and poor oral hygiene combined together could precipitate acute gingival inflammation that may progress to a periodontal condition in a patient receiving orthodontic therapy. Orthodontic appliances could act as a potential plaque retentive source and aggravate inflammatory reactions that are seen during pregnancy. During pregnancy, hyperplasia of the gingival tissues, also known as pregnancy epulides, may be due to poor oral hygiene, inadequate nutrition, or systemic hormonal stimulation [3]. However, during pregnancy, because of the presence of established gingivitis in some patients, the condition usually can progress to an irreversible breakdown of the periodontium [4]. However, especially during pregnancy, in cases that have pre-existing gingival inflammation, presence of orthodontic appliances could increase the demand of rigorous oral hygiene maintenance and in patients who lack that self-motivation; the periodontal condition may get aggravated when orthodontic appliances are present in the oral cavity. It is known that fixed appliances can act as plaque-retaining devices. However, when coupled with pre-existing gingival inflammation that may be present in a pregnant patient, there could be fast progression towards periodontal disease. There is a lack of awareness regarding oral health-care issues among patients who are pregnant and choose to seek orthodontic treatment. Our emphasis is on patient education, oral hygiene maintenance and preventive and treatment strategies for the management of gingival health in orthodontic patients during pregnancy.

Systemic factors that cause gingival inflammation can be broadly classified into genetic, haematological, hormonal, metabolic and environmental factors. Gingivitis and gingival hyperplasia have been associated with hormonal changes as seen during puberty, pregnancy and menopause. This belief is also supported by research that report an increase gingival inflammation in women taking steroid hormones, oral contraceptives and other drugs that contain oestrogen and progesterone [5, 6, 7]. Studies have shown that pregnant women have an increased incidence of gingival inflammation compared with non-pregnant women [8, 9].

2) Hormonal changes that affect tooth movement:- Estrogen

Estrogens are female sex hormones that occur naturally in three forms.

1. The first and most prominent form of estrogen is estradiol, which is produced from menarche to menopause and is important in the regulation of the estrous cycle.
2. The second form is estrone, produced after menopause, when the total amount of estrogens has decreased.

3. The third form, estriole, is expressed primarily during pregnancy.

Estrogen is considered to be the most important hormone affecting the bone metabolism in women. It inhibits the production of various cytokines which are involved in bone resorption by stimulating osteoclast formation and osteoclast bone resorption. It also inhibits osteoblasts' responsiveness to PTH. Estrogens do not have any anabolic effects on bone tissue; they directly stimulate the bone forming activity of osteoblasts.

Studies have shown that estrogens decrease the velocity of tooth movement [1]. Oral contraceptives, taken for long periods of time, can influence the rate of tooth movement. Androgens also inhibit bone resorption, modulate the growth of the muscular system, and may affect the length and results of the orthodontic treatment.

Progesterone

Progesterone has been shown to increase gingival exudates, affect the gingival vascularity and integrity of the capillary endothelial cells. The presence of increased sex hormones during pregnancy may cause epithelial separation and an increase in vascular permeability. Vascular and hormonal changes may increase the gingival crevicular fluid and aggravate response to plaque.

He *et al.* studied the effect of progesterone on orthodontic tooth movement (OTM). He found that progesterone influence the periodontal reconstruction on OTMs in pregnant rats and may be helpful in alveolar bone formation [10]. Long-term progesterone administration could reduce the rate of tooth movement [11]. Osteoclasts are primarily observed 2 days after force application. But there is lower number of osteoclasts in a pregnant woman 2 days after appliance insertion. This decrease in osteoclast number may be due to the gradual increase of estrogen and progesterone at early phases of pregnancy. It has been suggested that maximum osteoclasts recruitment happens 5-7 days after force application.

Relaxin

Relaxin has been known as a pregnancy hormone. It is released just before child birth to loosen the public symphysis, so that the relaxed suture will allow widening of the birth canal for parturition. In 2005, Liu and colleagues showed that the administration of Relaxin might accelerate the early stages of orthodontic tooth movements in rats [12]. Stewart and colleagues used gingival injections of Relaxin to relieve rotational memory in the connective tissues of maxillary lateral incisors that had been orthodontically rotated. In 2000, Nicozis and colleagues suggested that Relaxin might be used as an adjuvant to orthodontic therapy, during or after tooth movement, for promotion of stability, for rapid remodelling of gingival tissue during extraction space closure, for orthopedic expansion in non – growing patients, by reducing the tension of the stretched soft tissue envelope, particularly the expanded palatal mucosa, after orthognathic surgery.

3) Effect of various drugs in pregnancy and tooth movement

According to WHO (1966), drug is any substance or product that is used to modify or explore physiological systems or pathological states for the benefit of the recipient. During orthodontic treatment, drugs are prescribed to manage pain from force application to biological tissues, manage temporomandibular joint (TMJ) problems and tackle some infection throughout the course of treatment. Apart from these

drugs, patients who consume vitamins, minerals, hormonal supplements, during pregnancy and other compounds for the prevention or treatment of various diseases can also be found in every orthodontic practice. Some of these drugs may have profound effects on the short- and long-term outcomes of orthodontic practice. Hence, it is necessary to review the mechanism of action and effects of commonly used drugs on tissue remodelling and orthodontic tooth movement.

Analgesic

Analgesic is a drug that selectively relieves pain by acting on the CNS or peripheral pain mechanisms, without significantly altering consciousness.

Effect of NSAIDs on tooth movement

Most commonly used medications in orthodontics are for control of pain following mechanical force application to tooth. Inhibition of the inflammatory reaction produced by PGs slows the tooth movement. Recent research demonstrated the molecular mechanisms behind the inhibition of tooth movement by NSAIDs. The levels of matrix metalloproteinases (MMP9 and MMP2) were found to be increased, along with elevated collagenase activity, followed by a reduction in procollagen synthesis which is essential for bone and periodontal remodeling. The whole process is controlled by inhibition of cyclooxygenase (COX) activity, leading to altered vascular and extravascular matrix remodeling, causing a reduction in the pace of the tooth movement.

Aspirin:-

Many pregnant women take this medicine as pain killer but some of pregnant ladies are prescribed this medicine as for blood thinner. Due to some reasons the blood of pregnant lady get thicker and there is clot formation in placenta due to this the foetus does not get good amount of blood supply so the growth of foetus is either retarded or there are chances of foetal death. To reduce these chances gynaecologist prescribe a blood thinner. These drugs should be taken orally or intravenously. Acetylsalicylic acid and the related compounds, and their action result from inhibition of COX activity, which converts unsaturated fatty acids in the cell membrane to PG's. Clinical experience shows that orthodontic tooth movement is very slow in patients undergoing long-term acetylsalicylic therapy. Salicylate therapy decreases bone resorption by inhibition of PGs' synthesis and may affect differentiation of osteoclasts from their precursors. Therefore, it is recommended that patients undergoing orthodontic treatment should not be advised to take aspirin and related compounds for longer period during orthodontic treatment.

Bisphosphonates

Bisphosphonates (BPNs) have strong chemical affinity to the solid-phase surface of calcium phosphate; this causes inhibition of hydroxyapatite aggregation, dissolution, and crystal formation. Bisphosphonates cause a rise in intracellular calcium levels in osteoclastic-like cell line, reduction of osteoclastic activity, prevention of osteoclastic development from hematopoietic precursors, and production of an osteoclast inhibitory factor.

Studies have shown that BPNs can inhibit orthodontic tooth movement and delay the orthodontic treatment.¹³ Topical application of BPNs could be helpful in anchoring and retaining teeth under orthodontic treatment.

Vitamin D

Vitamin D and its active metabolite, 1,25,2(OH)D₃, together with parathyroid hormone (PTH) and calcitonin, regulate the

amount of calcium and phosphorus levels. Vitamin D receptors have been demonstrated not only in osteoblasts but also in osteoclast precursors and in active osteoclasts. Stimulatory action of vitamin D on osteoblasts can help stabilize orthodontic tooth movement.

In 1988, Collins and Sinclair demonstrated that intraligamentary injections of vitamin D metabolite, 1,25-dihydroxy cholecalciferol, caused increase in the number of osteoclasts and amount of tooth movement during canine retraction with light forces^[14].

In 2004, Kale and colleagues observed that local applications of vitamins enhanced the rate of tooth movement in rats due to the well-balanced bone turnover induced by vitamin D^[15]. In 2004, Kawakami observed an increase in the mineral appositional rate on alveolar bone after orthodontic force application; they suggested that local application of vitamin D could intensify the re-establishment of supporting alveolar bone, after orthodontic treatment^[16].

4) Eating habit and craving during pregnancy and its effect on orthodontic treatment

Some women experience unusual food cravings while they are pregnant. A regular desire for sugary snacks may increase your risk of tooth decay.

Oral health care during pregnancy

Many of pregnant women receive any dental care during pregnancy. Women with lower socio-economic strata tend to avoid visiting dental offices during pregnancy. In addition, there is a lack of awareness among women about the potential risk of poor pregnancy outcomes and periodontal disease. Thus dental care visits are reduced during pregnancy and some choose to wait until after delivery to address any oral healthcare needs. Studies have shown a correlation between periodontal disease and increased risk of preterm low birth weight babies. In addition, there is research to support that treatment of periodontal disease could reduce preterm births.

Orthodontic consideration and management

There are some factors that could make orthodontic treatment uncomfortable. For instance, the first trimester of pregnancy can manifest itself in the form of morning sickness. Several women actually suffer through morning sickness throughout their pregnancy. Morning sickness can have you feeling fatigued and dehydrated. Throwing up everything you eat can actually lead to malnutrition, and in severe cases, a pregnant woman may need to be hospitalized. So care should be taken not give them appointments in the morning time. All these can be bad enough on their own, but when you combine them with the soreness and discomfort that comes with wearing braces, it can all be hard to take. The initial days of your braces treatment can be discomfoting and even painful. A pregnant woman may find that she can't eat her food, because her teeth hurt too much, and she needs to eat to keep her energy up.

Allow women who have a high risk of producing offspring with oral clefts to be targeted with folic acid supplementation (mothers who already have a cleft affected child or those on medications which may induce oral clefts). Anti- convulsants including valproate, carbamazepine, and phenytoin and methotrexate have been observed to induce oral clefts in humans.¹⁷

Light and continuous force should be used as we know that periodontium is susceptible to breakdown with heavy forces and it's advisable to limit the visits to shorter appointments to avoid the patient being in extreme supine position especially

during the later stages of the pregnancy.

Radiographic imaging such as a panoramic film and periapical films are routinely used to assess periodontal health and root inclinations. According to American Dental Association (ADA), every precaution should be taken to minimize radiation during pregnancy. However, if there is an acute dental infection, it must be addressed and radiographs can be taken. In addition, the radiation caused by oral radiography is minimal. It is advisable to coordinate the orthodontic treatment plan with the obstetric care provider to establish guidelines that will be beneficial for maternal oral health and perinatal outcomes. Orthodontic treatment could include the necessity to have one of the teeth extracted. Tooth extraction by itself may not be dangerous for a pregnant woman. However, one must avoid taking X-rays during the first trimester of pregnancy. In fact, it's better to avoid X-rays for the entire duration of pregnancy. If a lady patient is up for a radiograph and suspect she could possibly be pregnant, it's advisable to wait till you confirm this before you go ahead and get an X-ray done [18].

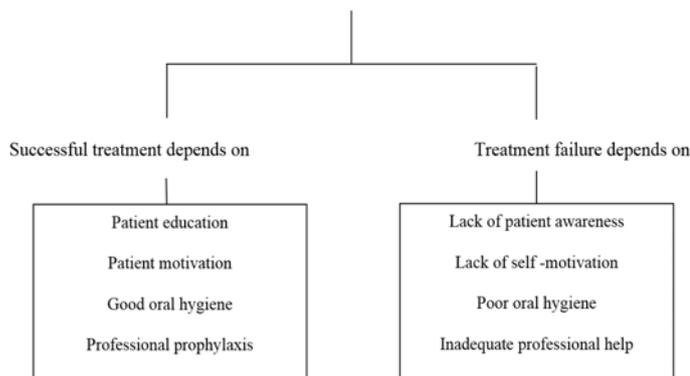
Orthodontic treatment plan

It is of very importance to plan a very simple and realistic treatment plan in patients who are pregnant. A good communication between the orthodontist and the patient is a key for successful results. If the patient wants to undergo orthodontic therapy primarily for frontal aesthetics and is not willing to be compliant for a 2-year treatment plan and comprehensive therapy, this needs to be established at the beginning. In such patients, limited treatment should only be performed. As an alternative in some patients, it may be advisable to wait until after the pregnancy to start orthodontic treatment [19].

Oral hygiene maintenance during orthodontic treatment

Before starting orthodontic treatment, any pre-existing periodontal condition must be checked. Because of pre-existing hormonal changes during pregnancy, the gingival tissues may be already inflamed in pregnancy women. Thus, a more rigorous oral hygiene routine will be required to maintain optimal oral health. Frequent dental prophylaxis will be helpful and meticulous home-care regimens will need to be employed to ensure success. In addition to tooth brushing, a detailed instruction in the manipulation of dental floss will enable the patient to floss when the braces are in the mouth. Many interdental cleaning aids such as tooth picks or miniature bottle brushes can be attached to handles for the convenience of manipulation around teeth. Thus oral hygiene regimen maintained at home and coupled with professional dental cleaning will ensure successful oral health and keep orthodontic patients during pregnancy free of gingival and periodontal disease during active treatment [4].

Orthodontic treatment during pregnancy



Role of professionals

For successful completion of orthodontic treatment, a good communication must be established between the patient and the orthodontist from the beginning. Detailed history, oral examination and assessment of patient compliance and expectations will enable the orthodontist to develop practical goals for successful treatment. It is important for orthodontists to be aware of the limitations that may be inherent in such cases. In addition to reinforcing oral hygiene, it is important that the patient be sent for professional cleaning at regular intervals. Good communication among health-care professionals will benefit the patient and improve their quality-of-life. We should use steel ligature in place of elastic modules because elastic modules are less hygienic [20].

However, there are no obvious contraindications to orthodontic therapy in a healthy pregnant patient. However, it may be advisable to limit the visits to shorter appointments to avoid the patient being in extreme supine position especially during the later stages of pregnancy. Radiographic imaging such as a panoramic film and peri-apical films are routinely used to assess periodontal health and root inclinations. Every precaution should be taken to minimize radiation during pregnancy. However, if there is an acute dental infection, it must be addressed and radiographs can be taken. In addition, the radiation caused by oral radiography is minimal. It is advisable to coordinate the orthodontic treatment plan with the obstetric care provider to establish guidelines that will benefit maternal oral health and perinatal outcomes.

Role of patients

It is important for women to be aware of the importance of oral health-care especially during pregnancy. We have therefore described in detail the known associations between periodontal disease and complications during pregnancy. Simple and effective home care measures described earlier and professional dental care will enable women to prevent any gingival and/or periodontal issues during the course of their orthodontic treatment [21]. It is important to emphasize that professional tooth cleaning alone is not sufficient for preventing gingival and periodontal issues and conscientious oral home care is also of paramount importance.

Patient education and awareness

It is important that medical professionals dealing with prenatal care be educated the importance of dental care to their patients. In addition, the dental health-care providers must be aware of the importance of dental care during pregnancy and effects of poor periodontal health on pregnancy and the baby. Various behavioral modification techniques could be employed. Constant motivation of the patient could help improve patient compliance during orthodontic treatment [22]. It is important to emphasize that professional tooth cleaning alone is not sufficient for preventing gingival and periodontal issues and conscientious oral home care is also of paramount importance. Thus, a combination of professional tooth cleaning and educational reinforcement of oral hygiene will prove to be successful.

Constant motivation of the patient could help improve patient compliance during orthodontic treatment. It is critical for the dental care provider to focus on changing the individual's perceived need towards oral health and or values associated. Especially during orthodontic treatment, which is over a period of a couple of years, constant reinforcement and periodic monitoring and occasional discussions with the patient are extremely crucial. Most importantly, there needs to be a

psychological change and motivation in the patient that will make them conscious about their oral hygiene status.

Conclusion

It has been found that orthodontic treatment during pregnancy may aggravate gingivitis caused by local and systemic factors. Periodontitis during pregnancy may lead to complications and preterm low-birth-weight babies. Awareness among oral and prenatal healthcare professionals is critical for optimal patient care. For successful completion of orthodontic treatment, a good communication must be established between the patient and the orthodontist from the beginning. Detailed history, oral examination and assessment of patient compliance and expectations will enable the orthodontist to develop practical goals for successful treatment. It is important for orthodontists to be aware of the limitations that may be inherent in such cases. In addition to reinforcing oral hygiene, it is important that the patient be sent for professional cleaning at regular intervals. Good communication among healthcare professionals will benefit the patient and improve their quality of life.

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