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Considerations while operating maxillofacial surgeries in a pregnant patient: A research review

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Abstract:*The main motto of putting forth this research article was to update the knowledge about some significant considerations while operating maxillofacial surgeries in a pregnant patient for maxillofacial surgeon or any consulting medical practctioner, which indeed will benefit the patient in getting a appropriate treatment thereby reducing the consequences.*
Keywords: pregnant patient, maxillofacial surgeries

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I. Introduction

One percent to 2 percent of pregnant women undergo nonobstetric surgery during pregnancy. Historically, there has been a reluctance to operate on pregnant women based on concerns for teratogenesis, pregnancy loss, or preterm birth. Traditional teaching suggests that surgery during the first trimester carries with it an increased risk of pregnancy loss that surgical procedures during the second trimester are associated with minimal risk, and that surgery during the third trimester is accompanied by an increased risk of preterm birth.[1,2] Furthermore, many dental providers are uncertain about the safety of performing dental procedures in pregnant women. Treatment of the pregnant patient has the potential to affect the lives of two individuals (the mother and the unborn fetus); hence, management of oral surgical procedures in these patients is a challenge for the maxillofacial surgeons.[3,4]

That's why we have put forth this research review which will update the knowledge of a maxillofacial surgeon while operating in a pregnant patient which indeed will help the betterment in the treatment of the patient.

II. Research Review

Physiological and hormonal changes in pregnant patient:

During pregnancy, the pregnant mother undergoes significant anatomical and physiological changes in order to nurture and accommodate the developing foetus. Changes in the coagulation system during pregnancy produce a physiological hypercoagulable state. The concentrations of certain clotting factors, particularly VIII, IX and X, are increased. Fibrinogen levels rise significantly by up to 50% and fibrinolytic activity is decreased. Concentrations of endogenous anticoagulants such as antithrombin and protein S decrease. Thus pregnancy alters the balance within the coagulation system in favour of clotting, predisposing the pregnant and postpartum woman to venous thrombosis. This increased risk is present from the first trimester and for at least 12 weeks following delivery.

An increase in stroke volume is possible due to the early increase in ventricular wall muscle mass and end-diastolic volume (but not end-diastolic pressure) seen in pregnancy. The heart is physiologically dilated and myocardial contractility is increased. Blood pressure decreases in the first and second trimesters but increases to non-pregnant levels in the third trimester.[5,6]

It is thought that increased levels of circulating catecholamines and cortisol contribute .to the leukocytosis seen in pregnancy.[7]

As a consequence of renal vasodilatation, renal plasma flow and glomerular filtration rate (GFR) both increase, compared to non-pregnant levels, by 40–65 and 50–85%, respectively. In addition, the increase in plasma volume causes decreased oncotic pressure in the glomeruli, with a subsequent rise in GFR. As the GFR

rises, both serum creatinine and urea concentrations decrease to mean values of about 44.2 μmol/l and 3.2 mmol/l, respectively.[8]

There is a significant increase in oxygen demand during normal pregnancy. This is due to a 15% increase in the metabolic rate and a 20% increased consumption of oxygen. There is a 40–50% increase in minute ventilation, mostly due to an increase in tidal volume, rather than in the respiratory rate. Pregnancy may also be accompanied by a subjective feeling of breathlessness without hypoxia. This is physiological and is most common in the third trimester but may start at any time during gestation. Classically, the breathlessness is present at rest or while talking and may paradoxically improve during mild activity.[5]

There is an increase in the production of thyroxine-binding globulin (TBG) by the liver, resulting in increased levels of thyroxine (T4) and tri-iodothyronine (T3). Serum free T4 (fT4) and T3 (fT3) levels are slightly altered but are usually of no clinical significance. Levels of free T3 and T4 do however decrease slightly in the second and third trimesters of pregnancy and the normal ranges are reduced. The World Health Organisation recommends an increase in iodine intake in pregnancy from 100 to 150–200 mg/day.24 If iodine intake is maintained in pregnancy, the size of the thyroid gland remains unchanged and therefore the presence of goiter should always be investigated. The thyroid gland is 25% larger in patients who are iodine deficient.[9]

During pregnancy there is also an increase in serum levels of deoxycorticosterone, corticosteroid-binding globulin (CBG), adrenocorticotropic hormone (ACTH), cortisol and free cortisol. These changes cause a state of physiological hypercortisolism and may be clinically manifested by the striae, facial plethora, rising blood pressure or impaired glucose tolerance.[10]

Serum prolactin which is secreted by pituitary gland increase in the first trimester and are 10 times higher at term. The increase in prolactin is most likely due to increasing serum oestradiol concentrations during pregnancy. Levels of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) are undetectable during pregnancy due to the negative feedback from elevated levels of oestrogen, progesterone and inhibin. Pituitary growth hormone production is decreased but serum growth hormone levels are increased due to growth hormone production from the placenta.[11]

Pregnant women require an increased intake of protein during pregnancy. Amino acids are actively transported across the placenta to fulfill the needs of the developing foetus. During pregnancy, protein catabolism is decreased as fat stores are used to provide for energy metabolism.[5]

Drugs used in pregnant patient:

The most commonly used medications classified as risky were ibuprofen, metoclopramide, and codeine, which were mainly used among women in Western and Northern Europe. Classification of these medications as potentially risky is related to the risks of premature closure of the ductus arteriosus after use in the third trimester, conflicting data on teratogenicity, and perinatal complications after use in the third trimester respectively.[12]

A total of 587 different medications were used by the study sample and classified according to the three risk classification systems. Using the combined classification method, 223 (38.0%) of the 587 medications were classified as probably safe to use during pregnancy. Probably safe medications were used by 4596 (69.0%) women, most commonly paracetamol (acetaminophen), ordinary salt combinations, and alginic acid. A total of 228 (38.8%) medications were classified as potentially risky to use during pregnancy and were used by 1881 (28.3%) women. The most frequent medications in this group were ibuprofen, metoclopramide, and codeine (combined products excluding neuroleptics).[13]

Metronidazole is an anti-anaerobic antibiotic that has previously been shown to be carcinogenic and mutagenic in certain bacteria. In more than 17,000 fetuses exposed to metronidazole in the first trimester; however, there was no increase in the rate of congenital anomalies. Another analysis by Burtin et al. found no increased teratogenic risk with the use of metronidazole.[14]

Penicillins and their newer derivatives are the most widely prescribed antimicrobial class in pregnancy. The fluoroquinolones are not recommended for treatment of oral and maxillofacial infections in the child or pregnant patient. The macrolides, such as erythromycin, azithromycin, and clarithromycin, do not cross the placenta to any significant extent. They do not cause fetal anomalies. The tetracyclines are to be avoided in the pregnant patient and in children, up to 12 years of age because of permanent dental staining.[15]

Radiation considerations in pregnancy:

A radiation dose of 10 Gy (5 Gy in the first trimester, when organogenesis is initiated) causes congenital fetal abnormalities. The exposure of any radiographic films required for management of the pregnant patient in most situations should not place the fetus at increased risk. It has been estimated that the dose to the fetus is approximately 1/50,000 of that to the mother's head in any of the exposure ranging from full mouth x-ray to CT images of head and neck. Adequate shielding and protective equipment must be used at all times.[16]

Maxillofacial surgery considerations in pregnant patient:

To prevent or alleviate supine hypotension, the pregnant patient should be rolled to the left side by 5_ to 15_ (a position in which the right hip is elevated 10–12 cm), which can be accomplished by inserting a wedge or pillow under the right hip. If this does not work to alleviate the hypotension, the patient can be placed in a full left lateral position.[17]

Elective procedures (eg, cosmetic surgery, orthognathics) should be delayed until the postpartum period. Some elective and emergent dentoalveolar procedures are more safely accomplished during the second trimester. If treatment is to be rendered, the patient should be positioned in the left lateral decubitus position, with the right hip elevated approximately 15 degrees (6–12 inches) above the surface of the chair.[18]

Head and neck infections should be managed aggressively in the gravid patient. There is a mild degree of immunosuppression in pregnancy, and sepsis is known to occur more frequently in pregnant than nonpregnant women. Severe septic complications that occur in pregnancy are associated with an increased risk of adverse fetal outcomes.[19]

Anesthetic considerations in pregnant patient:

General anesthetic agents have low teratogenic potential. In most studies, nitrous oxide, halothane, ketamine, methohexital, etomidate, and thiopental have been found to be safe. Likewise, curare and succinylcholine have not been associated with human teratogenic effects.

Lidocaine and other commonly used local anesthetic agents have not been associated with fetal malformations. The main concern in using these agents in a pregnant patient is overdose with increased vascular volume and permeability. The potential for local anesthetic toxicity is higher in pregnancy. Epinephrine should be used judiciously in patients with pregnancy-associated hypertension.[18]

III. Conclusion

We can conclude that, maxillofacial surgeon should have a concise knowledge about the considerations which should be taken while operating maxillofacial surgeries in a pregnant patient.

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