

Odontostomatological approach to the pregnant patient

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Abstract. – Pregnancy is a condition characterized by various physiological modifications (placental and ovarian hormones release) that influence various organic districts, including the oral district.

In this review were re-examined the rules about the execution of dental services with the relative indications and contraindications during the different phases of pregnancy, the use of the ionizing radiations and the pharmacologic therapy during pregnancy, considering the metabolic, anatomical haemodynamic modifications to which the gestant is exposed during this condition and considering the various parameters related to it: the pharmacokinetic modifications, the drug toxicity based on its teratogenic potential, indications, side effects and specific effects of drugs administered, the toxicological aspects of dental amalgams and the use of the local anaesthetics during pregnancy.

The authors conclude that pregnancy is not a contraindication for the dental treatment and existing an increase of oral diseases, the woman must be exposed to more frequent controls.

Key Words:

Pregnancy, Dental treatment, Local anaesthetics, Teratogenic potential, Ionizing radiations, Oral diseases.

Introduction

Pregnancy is a particular physiological condition characterized by various biochemical-metabolic modifications that predispose and adapt the feminine organism to the growth and maturation of the conception product during the thirty-six gestational weeks provided for the human kind. These modifications are reflected

on various organic districts, including the oral district. They depend essentially by the release of placental and ovarian hormones (human chorionic gonadotropin, human placental prolactin, estrogens and progesterone) that regulate the pregnancy progression, acting on the feminine genital apparatus and on the mammary glands.

Because of the endocrine apparatus delicate connection, however, these hormones influence also the not sexual endocrine glands activity and can exercise a direct action on some organs¹⁻⁴.

Physiological Modifications During Pregnancy

During pregnancy, the womb increases itself to the detriment of the other abdominal organs. The stomach is compressed, while its motility is reduced by the action of progesterone. For these reasons the pregnant woman aims to feed itself with small and frequent meals, to which not always follows an accurate cleaning of the oral cavity.

Consequently, to the stomach postponement is created also a partial incontinence of the gastroesophageal sphincter that favours the gastric content reflux.

They are frequent, mainly in the initial phases of pregnancy, the nausea and vomiting that make more difficult the intra-oral manipulation and compromise the oral hygiene state. The nature of these troubles is probably toxic, depending by the release of endometrium degeneration products, liberated in the moment in which it becomes invaded by trophoblasts^{1,5}.

The diaphragm is pushed towards the upper side and its excursion is reduced, provoking the pulmonary residual functional capacity reduction of 20%. To this is added the increased oxygen re-

quirement typical of pregnancy. Therefore, it is verified a reduction of its reserves that the organism aims to compensate with the increase of the breathing frequency. For the action of the hormones produced during pregnancy there is a major liquid holding, that brings to an increase of the volemia variable from 30% to 55%. Its increase depends essentially by the watery component and consequently appears an anemic state, physiological in this phase.

The growth of the ejection fraction and of the cardiac frequency increase the range with a percentage comprised between 33% and 40% and it is verified a raising of the blood pressure. The venous return is instead decreased by the peripheral venous system dilation.

The renal excretion increases for the growth of the glomerular filtering speed and for the renal flow increase, and increases also the sodium, chlorine and water reabsorption.

Oral Modifications

In the oral cavity the alterations are found at the salivary and periodontal levels⁶. Considering the saliva, over the frequent appearance of sialorrea from the second to the fifth month (secondary to anomalous gastro-enteric reflexes), there is an increase of the iron, calcium and potassium ions concentration and mucin, that favour the bacterial plaque adhesion. The salivary pH becomes more acid because of the action of estroprogestinic hormones and for the increase of the acid producers anaerobic bacteria consequent to the poor oral hygiene. The morning emesis, mainly on the first three months, can contribute to the decrease of the salivary pH. Often are referred xerostomias, that might result secondary to systemic lacks of compensation as hypothyroidisms, gestational diabetes, hypertension pharmacologically treated and to local mycotic complications.

The periodontal tissues become particularly susceptibles to the action of the steroid hormones, perhaps for the increase of specific receptors presence for these molecules, that are available in great quantity in the saliva from the fifth month. The intense hormonal activity typical of the first trimester, during which happens an increase of the chorionic gonadotropin production and, of the third trimester, during which the estrogens and the progesterone reach the highest levels, explains the effect of pregnancy

on the gingival response to the local irritants (Table I and II). They are verified intense hyperemias and venous stasis of the gingival microcircle, the appearance of an anaerobic subgingival flora, a destruction of the gingival mastocytes with local release of histamine and proteolytic enzymes that exacerbate the gingival phlogosis. At the base of the gingival tissues and mucosal alterations of the oral cavity can be also a deficit of the maternal T-lymphocyte response and the appearance of an agranulocytic leukopenia. During the gestational period can be present a subjective sensation of local tension followed by frequent gingival bleedings, both spontaneous and provoked. The algal symptomatology is referred only during acute infective complications. The prevalence of gravidic gingivopathies is reported with values from 36 to 100% on the base of the age, the analyzed population groups and the considered gestational periods. Nodular lesions defined gravidic epulides ("gravidic tumours" or pyogenic granulomas rised during pregnancy) can

Table I. Main oral manifestations during pregnancy.

| Dento-periodontal diseases |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Marginal gingivitis • Acute and sub-acute gingivitis • Acute and sub-acute periodontitis • Gingival hypertrophies • Periodontal diseases increase • Gingivo-periodontal pyogenic granulomas • Propensity to dental caries • Propensity to pulp diseases |
| Oral mucosal diseases |
| <ul style="list-style-type: none"> • Mucocutaneous pyogenic granulomas • Angiomatous manifestations • Mucosal atrophies due to B12 vitamin and folates deficiency • Erosions and micro-ulcerations due to iron deficiencies • Organic and iatrogenic hyposalivations • Organic hypersalivations • Acute pseudomembranous candidiasis • Chronic erythematous candidiasis • Angular cheilitis • Bacterial gingivo-stomatitis • Cheilitis and stomatitis due to HSV-1 • Oral mucosae burning • Orofacial paresthesias • Dysgeusias • Mucosal and mucocutaneous melanosis |

Table II. Positive correlations detected for small bowel CT findings.

| Effects of estrogens on the oral mucosas ⁶⁻⁸ | Effects of progesterone at the level of the oral cavity ⁶⁻⁸ |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Epithelium thickening; Submucosa thickening; Desquamation increase; Vascularization and aedema increase. | T-lymphocytes inhibition; Increase of PGE synthesis; Stimulation of histamine release and proteolytic enzymes from mastocytes; Selection of anaerobic bacteria strains |

rise with a feature characterized by proliferative inflammations with an angiomatous type, aspecific, with a marked infiltration of inflammatory cellular elements.

Oral Diseases During Pregnancy

Periodontal Disease

The periodontal disease or periodontitis is defined as “inflammatory disease of the tooth support tissues caused by specific microorganisms or specific microorganisms groups that cause a progressive destruction of the periodontal ligament and the alveolar bone with formation of pockets, recessions or both”⁹. The presence of a clinically observable attachment loss distinguishes the periodontitis by the gingivitis⁹.

The most frequent odontostomatologic disease that happen during pregnancy is the periodontal disease, that can manifest itself, depending of the oral hygiene conditions, with clinical features of various gravity from gingivitis types to worst lesions with the formation of periodontal pockets. The periodontopathy cause is strictly related to the placental and ovarian hormones secretion: where present, begins usually in the third trimester to increase in a critical manner at the eighth month, when the hormonal production is higher.

The maternity therefore favours the periodontitis progression with an increase of the inflammation, the bleeding and the alveolar bone loss. The periodontal infection represents an important risk factor for the fetus. In fact, the infection and their products transmission from the mother to the child increase considerably the risk of preterm birth and low birth weight of the newborn¹⁰⁻²⁰. This represents one of the major problems for the public health of the socially advanced countries. Together with other factors, as smoking and alcohol consumption,

the periodontal infection can represent an independent risk factor for the pregnancy complications²¹. The postulated mechanisms include periodontal pathogens translocation to the fetoplacental unit and the action of a periodontal reservoir of lipopolysaccharides or inflammatory mediators^{22,23}.

A study on 48 gestant women reported associations between the PGE-2 and IL-1-β levels of the gingival crevicular fluid and pregnancy complications²⁴. The results indicated gingival crevicular fluid PGE-2 levels significantly higher in mothers who gave preterm delivery or low birth weight babies, in comparison with the control cases. Furthermore in the primiparous preterm low-birth-weight mothers there was a significant inverse association between low birth weight, gestational age and gingival crevicular fluid PGE-2 levels. The microbiological data indicated four microorganisms mainly associated with the mature plaque and the progressing periodontitis (*Tannerella forsythensis*, *Porphyromonas gingivalis*, *Aggregati bacter actinomycetemcomitans*, *Treponema denticola*), detected at higher levels in the preterm low-birth-weight mothers, as compared with the control cases. *Fusobacterium nucleatum* and different *Streptococcus spp.* of possible oral origin have been detected in the amniotic fluid, but the PGE-2 and cytokine levels were not significantly different between women with or without signs of infection²⁵. *Fusobacterium nucleatum*, a common microorganism of the oral cavity, is the most frequently isolated species from amniotic fluid cultures among women with preterm labor and intact membranes. The isolation of *Fusobacterium nucleatum*, *Capnocytophaga* and other oral species from the amniotic liquid suggested the hypothesis of a possible oral-hematogenous route, which may lead an infection establishment and the subsequent preterm birth²⁶.

Meurman et al.²⁷ evaluated in a retrospective study the oral health of 207 pregnant women (with an average of 30 years), through the registration of DMFT index (decayed, missing, filled teeth), CPI (community periodontal index) and DHI (dental health index). The results did not show an association between poor oral hygiene and pregnancy or partum complications.

Hujoel et al.²⁸ performed a study on 793 gestant women to verify if the treatment interruption for chronic periodontitis during pregnancy may contribute to the increase of low birth weight of the newborn. The women were divided into 4 groups, on the base of the presence or absence of periodontal treatment (scaling and root planing and periodontal maintenance therapy) before and/or during pregnancy:

- 1st group: absence of periodontal treatment prior to and during pregnancy;
- 2nd group: absence of periodontal treatment during pregnancy, with chronic periodontitis diagnosed and treated before pregnancy;
- 3rd group: periodontal treatment prior to and during pregnancy;
- 4th group: periodontal treatment during pregnancy only.

From the reported results emerged that the use of the periodontal therapy was associated with smoking during pregnancy, diabetes, black race and the advanced age of the mother. After the correction of these factors the interruption of the periodontal treatment during pregnancy did not bring to an increased risk of a low birth weight of the newborn in comparison with the women that did not perform the periodontal treatment during pregnancy. The Authors concluded that women who received the periodontal treatment had genetic and environment characteristics, as smoking, diabetes, race, that were associated with an increased risk of low birth weight of the child. The periodontal therapies, before and during pregnancy, are not related to the risk of low birth weight child. The interruption of the periodontal therapy during pregnancy has not increased the risk of low birth weight child. This study confirmed that periodontal therapy was associated with factors that determine low birth weight of the newborn: cigarette smoking during pregnancy, race and diabetes.

Gravidic Epulid

Between the periodontal diseases, a lesion that is retained characteristic of the gestational period is the gravidic epulid. It is a iuxta-gingival neoformation generally of small dimensions, sessile, pedunculate, with a purple red color. The origin can be searched in the excessive tissue proliferation induced by steroid hormones in the presence of local irritant factors (gowerflow restorations or prostheses, decay or bacterial plaque). It is constituted by a connectival stroma richely vascularized, covered by stratified squamous epithelium. More frequent in the frontal side of the upper maxillary, it appears usually from the second trimester (although it can rise in every moment between the first and the ninth month) and it can revert spontaneously after the partum. However, the lesion aims to relapse in the case of following pregnancies. The gravidic epulid doesn't determine the below alveolar bone reabsorption and is usually painless. The eventual ulceration on traumatic base and the subsequent bleeding make indicate its excission.

Carious Lesion

The dental decay is a transmissible infective disease, with a multifactorial aetiology, whose characteristic lesion is the necrotic cavitation of the dental element, that is a progressive destructive process (from the crown to the pulp chamber), focal, characterized by the dissolution of the mineral matter and, the degradation of the organic matrix that constitute the hard tissues of the tooth.

It has not been clearly demonstrated a direct correlation between its insorgence and pregnancy. Although this, during pregnancy are often present some factors that can favour the appearance of the decay or an aggravation of the course of those already present. In this sense different conditions are indicated as predisposing²⁹.

The predisposing factors to the dental decay are:

- the qualitative modifications of saliva, that have a pH more acid and that contain more mucin, an adhesion factor for the bacterial plaque;
- the change of the alimentary habits with more small and frequent meals, for the slowed gastric emptying, and more rich in glucides to compensate the hypoglycemia induced by the increased requests of the fetus.

- the mineral lack of balance, that can influence the maternal natural reservoirs (teeth and bones), due to alimentary deficiencies and not, as it was believed in past, to the use of maternal calcium by the fetus (that influences this deficiency only for the 1%);
- the enamel erosion because of the morning vomiting, mainly if it is repeated;
- the poor oral hygiene associated with the reduced dental controls.

Psychological Modifications During Pregnancy

The dental disease is often supported by the particular psychological conditions in which is found the pregnant woman: beyond having to face its new identity of mother and the physical changes that the pregnancy involves, the gestant fears for the proper health and for the child's one and watches with suspicion to every diagnostic or therapeutic means that can become necessary.

Odontostomatological Treatment During Pregnancy

The pregnancy in itself doesn't have to represent an obstacle to the execution of the dental treatment excepted the case in which there are specific contraindications suggested by the gynecologist that follows the woman. It must emphasize the importance of a timely treatment in case of urgency in any moment of the pregnancy, since every diagnostic and therapeutic means, if used with criterion, will be sure less dangerous for the health of the woman and the fetus compared with an infectious state or acute pain³⁰⁻³². The infection not treated is associated in fact to an increase of fetal mortality. Is useful to adopt some expedients in the execution of the services during pregnancy to safeguard the health of the pregnant woman and the integrity of the future human being. These expedients can be distinguished in generic and specific:

Generic Procedures:

- Collect an accurate anamnesis;
- Demand or view the recent haematochemical exams;
- Do not send back the urgent operations;
- Program the not urgent services in the second trimester (surer);

- Postpone the not strictly necessary therapies at the finish of pregnancy;
- Control at the beginning and at the finish of the visit the artery pressure;
- Monitorate the peripheral wrist;
- Limit the duration of each visit (20-25 minutes);
- Modificate the gestant's position every 5 minutes;
- In the third trimester, privilege the seated position (inferior cava vein's syndrome);
- Possible the use of local anaesthetics, preferably without vasoconstrictives;
- Perform radiographic exams only if indispensables (to limit the exposition with suitable protections);
- Prevent the cross infections transmission;
- Instruct the woman on the importance of regular controls and fluoroprophylaxis;
- In the case of serious complications, the woman must be followed in hospitals;
- Eventually request the gynecologist opinion.

Specific Procedures:

- Execute eventual dental extractions before pregnancy (if programmed);
- Postpone the conservative therapies at the finish of pregnancy and control the dental decays with temporary fluoride cements;
- In the case of pulp diseases, operate immediately with adequate methods and means;
- Program monthly visits of professional oral hygiene;
- Instruct adequately to the domiciliary oral hygiene;
- Program many visits in the case of conspicuous bleeding during the cleaning phases;
- Prescribe mouthwashes with chlorhexidine (0.2%) before and during the therapeutic visits;
- Perform regular odontostomatological control visits in patients affected by systemic diseases;
- Postpone at the end of pregnancy the surgical operations for oral biopsy procedures;
- Limit the use of local anaesthetics;
- In the case of acute and chronic mycoses, recommend only local applications with antimycotics;
- Limit the use of systemic antiviral drugs (consult eventually also the gynecologist);
- Prescribe salivary substitutes in the case of xerostomias;
- Prescribe antibiotic therapies with amoxycillin or macrolides (consult eventually also the gynecologist);

- Prescribe anti-inflammatory therapies with paracetamol (consult eventually also the gynecologist).

The dentist moreover, before the performing of any invasive manoeuver with therapeutic purposes during pregnancy must take in consideration the gestation periods indicated and contraindicated for the odontostomatological treatment (Table III).

In the first trimester there is a major risk for the embryo, because is a full organogenetic phase and it is high the probability that an external factor might provoke malformations or quite a miscarriage. The future mother is, moreover, often unstable emotionally because of the estrogens induced betaendorphines production and goes frequently to meet emesis phenomenon.

In the last trimester the element that interferes negatively is represented by the patient's dimensions. If the gestant is extended, the womb pressure on the inferior cava vein can in fact provoke the appearance of a hypotensive syndrome, that is corrected positioning the woman on the left flank, to dislocate the womb on this side. In the more serious cases there can be verified a compression on the abdominal aorta artery, that could bring to a serious insufficiency of the uteroplacental circle with fetal hyposia.

In the last phase is present also the risk of a premature stress induced partum.

Table III. Indications and contraindications to the odontostomatological treatment in the different phases of pregnancy.

| Indicated |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>II-nd trimester:</p> <ul style="list-style-type: none"> • Organogenesis complete; • Not limiting abdominal dimensions. |
| Contraindicated |
| <p>I-st trimester:</p> <ul style="list-style-type: none"> • Organogenesis in active phase (danger of malformations and miscarriage); • Nausea and vomiting; • Emotional instability. <p>III-rd trimester:</p> <ul style="list-style-type: none"> • Increase of the abdominal volume (Inferior cava vein's syndrome); • Premature partum risk |

Every period of pregnancy is however indicated for the performing of controls (at least once every three months) and to actuate all the necessary hygiene procedures. During these visits the woman could be also motivated on the importance of the prenatal fluoroprophylaxis, that has the aim to make the enamel more resistant since the first mineralization phases. To this purpose the gestant will have to be well-educated to assume daily through oral administration 1 mg of fluoride in tablets since the fourth month, according to the ADA's indications³².

Use of Ionizing Radiations During Pregnancy

A particular attention is made in the use of the ionizing radiations in pregnant women. The exposure in the first 10 days of intrauterine life can provoke the miscarriage while for the rest of the first trimester is high the malformations risk. In any case, the exposure during all the pregnancy period increases the risk of leukaemia and neoplasias for the newborn.

The harmful effects, however, are revealed for doses over the 0.05 Gy (5 rad), much greater regarding those used for the execution of an intraoral radiography.

In Italy exist various norms contemplated in the D.L. 187/2000 that make also some indications to care of the particular protections during pregnancy and breast-feeding. It is cited that if the dose is more than 1 mSv (0.1 rem) on the base of the dosimetric evaluations, it must be placed a particular attention to the justification in the use of the means and to the optimization processes that regard the protections foreseen for the mother and the fetus.

When a radiography is performed the dose absorbed by the fetus is, moreover, six times inferior compared with that of the daily absorbed natural radiations. If there are used adequate shieldings, films with high sensibility, high voltage, long cone and collimation, then the risk is practically null.

The radiographies will go only executed if truly necessary, avoiding for how much possible the first trimester and resorting to every precaution that can reduce the fetus exposure.

In the case of endodontic treatments the problem can be partially resolved by using electronic apex localizers.

Pharmacologic Therapy During Pregnancy

During the dental treatment the recourse to the pharmacologic therapy is not rare, species in case of acute pathological episodes. The dentist must face however the problems with general and local characteristics made by these gestants with the due skill and scrupulousness from the moment that any performed therapeutic maneuver will have the singular characteristic to involve at the same time the mother and the fetus.

It is therefore necessary to know every possible teratogenic effect, toxic or whatever harmful of the substances employed during any treatment knowing that is mainly the fetus to be in the extreme sensible to the depressing effects of the drugs that can act both indirectly, in response to the maternal changes, and directly following the transplacental passage. In fact in spite of other sites, as the amniotic liquid, the fetal membranes, the skin, the kidneys and the gastrointestinal tract with the swallowing, participate to the process of substances changing between mother and fetus, the transport is performed mainly through the placenta for bidirectional way³³.

Pharmacokinetic Modifications During Pregnancy

During pregnancy the distribution is modified by the appearance of new compartments as the placenta, the amniotic liquid, the same fetus, the increase of the body water, the plasmatic volume and the decrease of plasmatic albumin available to bind the drugs, because it binds to the sexual hormones (therefore with a subsequent increase of the free drug concentration). The metabolism is modified by the effects of the estrogens and progesterone on the hepatic microsomal enzymes. The intestinal absorption is conditioned by the slowed gastric emptying and that parenteral from the expansion of the peripheral venous circle. Also nausea and vomiting can modify the absorption. The urinary excretion is increased for the increment of the glomerular filtration speed and of the plasmatic flow.

Factors that Can Influence the Transplacental Passage of a Drug

The transplacental passage of drugs can be influenced by various factors: the molecular weight, the lyposolubility, the ionization degree, the drug proteic affinity and the maternal-fetus concentration gradient.

Being lypoproteic the changing surface of the placenta, in a situation in which the uteroplacental flow and the fetal and maternal homeostasis are normal, generally the molecules that are lyposolubles, not aggregate, not ionizing or undissociated and with low molecular weight are transported more rapidly than hydrosolubles molecules, binded to proteins, ionized or dissociated and with high molecular weight.

Mechanisms that Favour the Placental Transportation

The mechanisms that favour the placental transportation are: the simple diffusion, the facilitated diffusion, the active transport and the pinocytosis.

The main part of anaesthetic drugs penetrate the placenta with a simple diffusion, a transportation that does not imply any energy employment from the membrane and with which a substance is distributed according to Fick's law that is with the molecules movement from a high concentration zone to a smaller concentration zone in the direction of the electrochemical gradient.

Other Important Aspects of Drugs

The toxicity of a drug depends by a series of factors: the chemical nature, the action time, the dosage level and duration, the ability to reach the fetus and the fetus genetic store.

Another important aspect is the teratogenic potential of some drugs, that can penetrate the placenta with extreme facility.

The drug dose that arrives in the fetal circle depends however by different factors. The most important are: the molecular weight, the plasmatic proteins bound and the ionization degree.

In the fetus the drug is distributed to the most vascularized organs. The most sensible is the central nervous system (CNS) for the immaturity of the haematoencephalic barrier.

The possible drug effects vary according to the gestation phase in which they are administrated:

- Until 10 days is valid the rule of "all or nothing" that is or the miscarriage or there will not be any effect.
- The days from the 7th to the 57th are the most risky because it is acting the organogenesis. The toxic action of the drug in this phase has as consequence the malformation of the structures that are developing at the moment of the therapy.

- After the twelfth week it begins the fetal period, considered relatively less risky. The toxic agent in this period can however provoke growth delay, reduction of the organic growth and functional damages.

The metabolic damages are more frequent when the drug is administrated in the last days of pregnancy. It can be observed that already during the first trimester the fetus can metabolize some drugs because of the presence of hepatic enzymes of the oxidative system³⁴.

Pharmacologic Therapy Choice

Recently some scientific organizations (FDA-Food and Drug Administration, ADEC-Australian Drug Evaluation Committee, FSS-Farmaceutiska Specialiteter i Sverige and the WHO-World Health Organization) have identified some drugs indicated or not indicated in pregnancy.

The data, deriving from studies of observation and performed on animals have some limits because exist various specificities that can act on the embryo and on the fetus, or dose-dependent and species-specific that due to a critical period of exposure.

The drugs are classified in five categories, on the base of their capacity to cause malformations to the newborn (Table IV).

- A category: null risk;
- B category: not significant risk;
- C category: risk demonstrated in studies on animals or there are not sufficient studies on pregnant women;
- D category: high risk;
- X category: drug surely teratogen.

In the Tables V and VI are illustrated the drugs indicated and contraindicated during pregnancy and their effect on its course, according to Balligan et al³⁵.

Toxicological Aspects of the Dental Amalgams

The toxicity of a substance is evaluated on the base of the contaminated substance quantity and in this case all the substances are potential poisons: all is a question of dose. The cycle that a substance has in our organism (metabolic model) is in function of some parameters: the contamination, the distribution, the deposition, the biotransformation, the retention, the accumulation and the excretion. In the human organism, the contamination with mercurium happens through the gastrointestinal tract, the breathing ways, the skin and the mucosas, while the excretion hap-

Table IV. Classification of the pharmacological molecules assumption in pregnancy (US FDA).

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| <p>Studies performed on humans have not evidenced an increase of the teratogenic risk for the fetus in the first trimester</p> <ul style="list-style-type: none"> – Acetylsalicylic acid – Amoxicillin-ampicillin – Atropine sulfate – Bacampicillin – Cefalexin-cefalotin – Clindamycin – Chlorpromazine – Calcic heparin – Erythromycin – Insulin – Isoniazid – Methyl dopa – Miconazole – Nystatin – Nitrofurantoin – Paracetamol – Spiramicin – Theofillin <p>Studies performed on animals do not show risks for the fetus. The drugs widely used during pregnancy and for which it can be deduced the absence of teratogenic effects on the fetus but for which do not exist definitive studies:</p> <ul style="list-style-type: none"> – Tranexamic acid – Aminofilline – Amitryptiline – Betametason-desametason – Cefazolin-cefotaxime – Cimetidine – Chloramphenicol – Diazepam – Phenobarbital – Fluocinolone – Phosphomycin – Ibuprofen – Hydrocortisone – Indomethacin – Lincomycin-josamycin – Ketoprofen – Methadone-morphine – Methyl-prednisolone – Prednisolone-Prednisone – Metronidazole – Naproxen – Nifedipine – Piperacillin – Progesterone – Triamcinolon <p>Studies performed on animals did not show fetal damages, but there are not controlled studies in women because of their limitate use in pregnancy</p> <ul style="list-style-type: none"> – Acyclovir – Athenolol – Carbamazepine – Cyclosporine – Diclofenac – Estradiol-Estriol – Furosemide – Gentamycin – Nimesulide – Norfloxacin – Pyroxicam – Ranitidine – Tyclopidine <p>The assumption of these drugs has supplied, in the experimentation on the animals, interlocutor or harmful results for the fetus; uncertain is their effect on man</p> <ul style="list-style-type: none"> – Azathioprine – Pipemidic acid – Chloroquine – Dilthiazem – Flurbiprofen – Glucagon – Ketoconazole – Levodopa – Rifampicin <p>Drugs that have shown, in the man, damage effects on the fetus, if administrated during pregnancy</p> <ul style="list-style-type: none"> – Cyclophosphamide (monohydrated) – Chlortetracycline (hydrochloride) – Isotretinoin – Lithium carbonate – Cytostatic agents-Methotrexate – Minocycline – Retinoids-A vitamin – Streptomycin – Thalidomide – Testosterone – Warfarin |
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Table V. Indicated and contraindicated drugs according to Balligan³⁵.

| | Indicated | Contraindicated |
|--------------------|------------------|---------------------------------------------------------------|
| Antibiotics | Penicillines | Tetracyclines Aminoglycosides Chloramphenicol |
| | Cefalosporins | Metronidazole |
| | Macrolides | Vancomycin Lincosamides Erythromycin estolate |
| Analgesics | Paracetamol | Acetylsalicylic acid (in the third trimester) Other NSAIDs |

pens through the excrements and the saliva. The mercurium accumulation regards the central nervous system (CNS), the liver, the kidneys, the hair and the nails.

The risk of toxicity induced by the mercurium contained in the dental amalgam is practically null for the exposures limited to the single conservative treatments, mainly if are taken all those precautions necessities to avoid the mercurium vapours inhalation or its ingestion and that are: the use of dental dam, an adequate aspiration and the use of predosed caps. However, is demonstrated that the mercurium vapours released by the dental restorations in amalgam performed in rats of feminine sex in pregnancy are distributed to the maternal and fetal organs (brain, liver and kidneys) with dose-dependent values on the base of the number of the present amalgam restorations³⁶.

The problem exists also in the case of chronic exposition to the mercurium vapours that interests the dental personnel. The subjects of feminine sex in a fertil age, that carry out their activity in the odontostomatologic field, should be protected according to that hygienic rules necessities to avoid the extended contact with this substance.

Table VI. Specific effects of drugs administrated during pregnancy according to Balligan³⁵.

| Drug(s) | Effect(s) |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Penicillines and Cefalosporines | Their use can be considered sure. The only contraindication is given by the eventual allergy of the gestant. In the allergic subjects the first choice alternative is represented by the macrolides: also these drugs are not toxic for the fetus and therefore can be prescribed in pregnancy |
| Erythromycin estolate (Macrolide) | Its administration is to avoid because it can cause colestatic hepatitis in the gestant |
| Tetraciclins | Their use is contraindicated because, binding to the Ca ⁺⁺ ions are deposited in the skeletal apparatus and in the teeth that are in the mineralization phase, provoking skeletal malformations, bony growth delay and pigmentations yellow-tawny of the teeth associated to enamel hypoplasia |
| Chloramphenicol | Its use in pregnancy is not advised because it depresses the medullary activity and can provoke aplastic anemy of the newborn or agranulocytosis |
| Aminoglycosides e Vancomycin | They are oto-nephrotoxic for the fetus |
| Clindamycin | It is not teratogenic but it can provoke in the gestant a serious pseudomembranous colitis. |
| Metronidazole | It must not be administrated because of its mutagen potential |
| Paracetamol (Acetaminophen) | It has antipyretic and analgesic properties, but it has a low anti-inflammatory action. It is privileged because its anti-prostaglandinic action is reversible, compared to other types of non steroidal anti-inflammatory drugs that are not advised because of their inhibiting effect on these mediators synthesis |
| Acetylsalicylic acid | Its use is controversial: although to toxic doses in the animals can have a teratogenic effect, at normal doses it does not provoke malformations in the fetus. However, it inhibits the prostaglandin synthesis, reducing the uterine contractions. Another effect is that antiaggregant, reason for which it increases the bleeding time and subsequently the postpartum haemorrhage risk. From the acetylsalicylic acid can depend the premature closure of Botallo arterial duct. For all these reasons its administration is avoided, at least in the last trimester |

Anaesthetic Use in Pregnancy

In the event in which the dentist it is found forced to operate and it is requested the employment of the local anaesthesia to avoid useless stresses to the gestant, the choice of the anaesthetic must be performed with particular attention and requests a particular knowledge of the employed substance, its action mechanism and probable collateral effects.

The local anaesthetics mainly used in dentistry are: lydocaine, mepivacaine, bupivacaine and prilocaine.

Lydocaine

The lydocaine is an amidic local anaesthetic, introduced in 1948, characterized by low allergic power, action rapidity and a relatively long duration (60 min). Although it is effectively used without vasoconstrictives, the adrenaline adding reduces the absorption in the circle and prolonges the action duration (120 min). It has a short latency period and it presents a good anaesthetic and of surface activity. It reaches the haematic peak with an average of 15-20 min from the administration. It has a half-life of about 2 h and it is metabolized to the hepatic level and then it is excreted mainly on the renal way both as drug and as metabolite. The metabolites deriving by the hepatic dealkylation (monoethylglycine xylilide and glycine xylilide) are actives and they contribute to the drug toxicity, mainly on the central nervous system (CNS). In the case of overdosage are observed: tremor of the eyebrows, tinnitus, dysgeusia and agitation. To toxic doses are manifested: convulsions, hypotension, bradycardia, coma, breathing depression and breathing arrest³⁷.

In dentistry is used in a solution at 2% without and with adrenaline (1:50,000, 1:80,000 and 1:100,000), with noradrenaline or with adrenaline + noradrenaline and in a formulation at 15% for the superficial anesthesia. These drug must be used during pregnancy only in the case of effective necessity keeping present that the possible risks are represented by uteroplacental insufficiency and by behavioural alterations of the newborn.

Mepivacaine

It is an amidic local anaesthetic, introduced in 1959, with a long action duration. Its haematic peak depends by various factors as the block type, the solution concentration and the presence

or absence of adrenaline. For the dental use is available in solution at 3% without vasoconstrictive and at 2% with adrenaline (1:80,000 and 1:100,000)³⁷. In an average, when employed without adrenaline, the haematic peak is reached after 30 min from the administration; with the adrenaline, the periods are duplicated or triplicated directly. The mepivacaine has a half-life of approximately 2 h, is metabolized to the hepatic level and excreted in prevalence through the renal way both as drug and as metabolite.

This anaesthetic is contraindicated in the cases of pregnancy assessed or presumed because were demonstrated toxic effects on the conception product that provoke bradycardia and fetal acidosis also when the fetal concentrations are equal or inferior to the maternal ones.

Bupivacaine

It is an amidic local anaesthetic, introduced in 1963, with an analgesic power and action duration greater regarding the other local anaesthetics, but it has also a cardiotoxicity clearly greater. The induced anaesthesia lasts according to the employment conditions from 4 to 20 h. The haematic peak depends by various factors: the block type, the solution concentration, the presence or absence of the adrenaline. It has a plasmatic half-life of over 2 h. Metabolized to the hepatic level, it is excreted mainly through the renal way both as drug and as metabolite.

It is absolutely contraindicated in the cases of pregnancy assessed or presumed because were reported cases of cardiac arrest following the use of bupivacaine for epidural anaesthesia in parturients and in the majority of the cases this is happened following the use of the solution at 0.75%.

Prilocaine

The prilocaine is an amidic local anaesthetic, introduced in 1953, with a similar profile with the lydocaine, but with the exception of this is a secondary amine and has a minor vasodilant action. In dentistry is used in a solution at 3% with felipressine or for topical use in association with the lydocaine in cream for skin and mucosas³⁷. Its use is particularly advised during pregnancy because it can damage the conception product with two modalities:

- causing methaemoglobinemia in the fetus for a deficit of erythrocytary methemoglobin reductase;

- causing methaemoglobinemia in the mother and therefore diminishing the oxygen quantity available for the fetal tissues.

The drug, in fact, once absorbed is metabolized in the liver and in the kidney producing O-Toluidine, agent able to oxidize the iron of the haem group and it is able to provoke a methaemoglobinemia with a subsequent reduced oxygen transportation ability.

Dental Treatments that Require the Use of Local Anaesthetics

The pregnant woman, for its particular condition that exposes her to various complications, must be considered in the field of dentistry, as a risk patient and the treatments to which her must be subordinate and that require the use of local anaesthetic can be excepted keeping present some simple precautions:

- Consult the gynecologist to know the psychophysical state of the gestant;
- Consider the gestational period in which the treatment is performed avoiding the services in the first trimester;
- Adopt short therapeutic visits;
- Use local anaesthetics without vasoconstrictive in the minimal effective dose having cure to perform always the aspiration during the anaesthetic injection.

Discussion

The interaction between oral and systemic health was since always an object of great interest in medicine. It was demonstrated that the pregnant women have a higher prevalence (36-100%) of gingival inflammation compared with the not pregnant women. The hormonal and vascular changes associated to pregnancy can determine an exaggerated gingival response to the bacterial plaque.

However, good oral hygiene manoeuvres can minimize the gingival diseases during pregnancy³⁸⁻⁴². Recently, the research evidenced an association between periodontal disease and preterm newborns and with low birth weight.

Lopez et al.⁴³ showed that the periodontal disease could represent an independent risk factor for the preterm birth and for the low birth weight

after the correction of known risk factors. In fact, the treatment of periodontal disease showed a reduction of the preterm birth⁴³⁻⁴⁵. Other studies have evaluated different associations between periodontal disease and pregnancy as the increased risk of developing preeclampsia during pregnancy and periodontal disease and positive correlations between periodontal status and levels of seric IL-8 and IL-1- β .

The results of various studies indicate that only the 27% of the examined women perceived signs of inflammation, felt the necessity of dental cures or intensified the oral hygiene manoeuvres during pregnancy⁴⁶.

Habashneh et al.⁴⁷ have performed a study on 625 women to evaluate the use of dental services during pregnancy, the degree of knowledge regarding the oral health during pregnancy and its effect on the course of the pregnancy. To the gestants was distributed a questionnaire regarding the habits, the information, the life style, the knowledge of the possible association between oral health and pregnancy. The factors related to the use of dental services during pregnancy resulted:

- Demographic: age, race/ethny, education, civil/status;
- Behaviour with the aim of oral hygiene: brushing, use of dispositives for the cleaning of the interproximal zones, frequency of the dental visits (when not in pregnancy);
- Life style: smoking, alcohol consumption;
- Economic: familiar yield, dental assurance;
- Factors related to pregnancy: low birth weight, premature birth, prenatal care;
- Information: regarding the health status of pregnancy on the oral health, regarding the effect of the poor oral hygiene on the course of pregnancy.

The study of Habashneh et al.⁴⁷ evidenced the self-reported of the dental services in a Caucasian population with a relatively high socioeconomic status. The number of the dental visits when not in pregnancy was strongly related with the number of controls during pregnancy. Mothers that reported a visit to the dentist every 6-12 months when not pregnant, were more motivated to perform a dental visit also during pregnancy compared to the women that reported a visit every 2 years to the dentist when not pregnant. Over the age and the information, the educational level was a significant predictive factor for the dental visits.

In this study we have performed a review of the literature taking in consideration the most frequent oral diseases found during pregnancy and their correlation with the pregnancy course and their eventual effect on the partum and on the newborn's weight, the use of the ionizing radiations and the pharmacologic therapy during pregnancy, the toxicity of a drug on the base of its teratogenic potential, the toxicologic aspects of the dental amalgams and the use of the local anaesthetics in pregnancy. We have treated also the norms about the execution of dental operations with the relative indications or contraindications during the different phases of gestation.

Conclusions

The pregnancy itself does not represent a contraindication for the dental treatment, indeed: being an increase of some oral diseases, the woman must be subordinated to more frequent controls. The necessary treatments must be programmed, in the second trimester.

In the event of urgency, however, the operations must be timely, independently by the gestational phase, because an acute pathological state is surely more dangerous than any diagnostic and therapeutic mean used with the due precautions.

Every time that a doubt regarding the therapy to adopt is present, the most suitable treatment could be established according with the gynecologist that follows the gestant.

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