Thyroid cancer and pregnancy: a systematic ten-year-review

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Background: Thyroid cancer is the second most common malignancy during pregnancy, especially the well-differentiated thyroid cancer (well-DTC). Therefore, complex medical and social dilemmas arise, dealing with which requires deep knowledge of the nature and characteristics of the disease and pregnancy as a whole. The purpose of this review is to present the diagnostic and therapeutic strategies of thyroid cancer during pregnancy and the postpartum period.

Methods: Extended review of the literature [2011–2023] was performed. Two hundred ninety-six articles were found, from which 225 were excluded due to irrelevant subjects. Seventy-one articles were assessed for eligibility, from which 33 articles were cohort studies and case reports and were included in the review.

Results: From the 33 included studies, 18 were retrospective cohort studies, 1 was cohort study, 2 were case control studies, 1 was meta-analysis and 11 were case reports. The primary endpoints of these studies refer to the progression and recurrence of DTC during pregnancy, the prevalence of thyroid cancer in pregnancy and the most appropriate time for surgical intervention.

Conclusions: The majority of the studies agree that well-differentiated tumors with mild clinical and imaging characteristics do not require immediate surgical treatment, but mere monitoring. Surgery can be delayed after childbirth. In contrast, tumors with aggressive behavior as well as non-differentiated ones, require immediate surgery because delay under these circumstances can dramatically reduce survival rates. Finally, a history of thyroid cancer does not seem to affect future deliveries, on condition that no residual disease exists at the onset of pregnancy.

Keywords: Thyroid gland; pregnancy; thyroid cancer

Introduction

Thyroid cancer is a disease with rising incidence worldwide, affecting all nations and age-groups, especially among women of reproductive age, that is under 45 years old. These women account for 36% of thyroid cancer cases (1). In contrast to men, women are affected three times more often, especially in eastern Europe. However, this increase in incidence is not accompanied by an equivalent increase in mortality (1).

Thyroid cancer is the second most common malignancy during pregnancy, second to breast cancer, with an incidence of 14 out of 100,000 pregnant women (1,2). Almost 10% of thyroid cancer cases among women of reproductive age are

diagnosed during pregnancy or the early postpartum period. The 75% of these cases are diagnosed within the first 12 months after delivery (2-4). Risk factors include exposure to radiation, iodine deficit, sex hormones and genetic syndromes like multiple endocrine neoplasia type 2 (1–2% of thyroid cancer cases) (1-3). In general, well-differentiated thyroid cancer (well-DTC) in younger patients has excellent prognosis and survival rates in pregnancy are comparable to those of non-pregnant women (2).

During pregnancy, thyroid gland increases from 10% to 30–40%, according to the adequacy of iodine, especially during the first and the last trimester (1,3,5). Iodine requirements and thyroid hormone production are also increased at 50% (5,6). Thyroid-stimulating hormone (TSH) fluctuates, decreasing during the first trimester compared to second and third trimester. The American Thyroid Association (ATA) recommends using a lower limit of TSH of 0.1 mIU/L and an upper limit of TSH of

4 mIU/L (7). Maternal thyroid hormones are the only source of thyroid hormones for the fetus up until the 12th week of gestation, because its thyroid gland cannot accumulate iodine until that moment (1,4).

Beta human chorionic gonadotropin (β-hCG) also plays an important role in the thyroid function because its structural similarity to TSH can lead to activation of TSH-receptors that are normally expressed onto thyroid cells (1,5,8). This leads to an increase of the activity of the gland and a decrease of serum TSH levels until the 12th gestational week (1). In addition, estrogens induce the increase of serum thyroglobulin (HTG) through boosting the HTG gene expression, due to activation of estrogen receptors (ERs), that are normally expressed onto thyroid cells (2).

A nodule is often referred to as a lesion of the thyroid gland that is radiologically discrete from the surrounding thyroid tissue. Thyroid nodules are common during pregnancy. An increase in newly formed nodules is also apparent during gestation, as well as an increase of the volume of the already existing ones (1,6). Twenty percent of women diagnosed with a nodule in the early trimester of pregnancy will develop a second one until delivery (6). The frequency of thyroid nodules during pregnancy ranges from 3–30% and is associated with older age of the mother (4,6). The possibility of a randomly discovered nodule to be malignant remains to be assessed (6) The incidental finding of a thyroid nodule during pregnancy warrants evaluation (1).

As with general population, a detailed personal and family history and a thorough physical examination are mandatory in the early management of the disease (3,6). Feedback about previous exposure to radiation or history of cancer among the family are the cornerstone of the diagnosis (6).

Cervical ultrasound imaging is a safe and trustworthy method of nodule diagnosing during pregnancy (3,5,6). Ultrasound findings that imply malignancy are: irregular and subechoic margins of the lesion, increased and chaotic vascularization, microcalcifications, absence of peripheral halo, nodules that are larger longitudinally than transversally, expansion towards neighboring tissues and lymph node existence (1,3). These characteristics, according to the ATA guidelines, can as well indicate further investigation with fine needle aspiration (FNA) biopsy and cytological examination of the lesion (1,6,7,9).

FNA is a safe method for assessing a suspicious thyroid nodule during pregnancy and is recommended both by both the ATA and the Endocrine Society (ENDO) (1,5). It can be

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Highlight box

Key findings

- This study supports that well-differentiated tumors with mild clinical and imaging characteristics do not require immediate surgical treatment, but mere monitoring. Surgery can be delayed after childbirth. In contrast, tumors with aggressive behavior as well as non-differentiated ones, require immediate surgery because delay under these circumstances can dramatically reduce survival rates. Finally, a history of thyroid cancer does not seem to affect future deliveries, on condition that no residual disease exists at the onset of pregnancy.

What is known and what is new?

- Papillary thyroid cancer is the most common thyroid malignancy diagnosed during pregnancy and postpartum. The impact of pregnancy on aggressiveness and disease progression is unclear. The optimal timing for surgery is disputable.
- Well-differentiated thyroid cancer progression seems not to be affected during pregnancy, although several hormonal changes occur. Either in cases of thyroid cancer diagnosis during pregnancy or in cases of follow-up after surgery, progression of the disease is the same as in non-pregnant women. Although surgery could be postponed in postpartum period, it could be mandatory during pregnancy regarding risk factors such as tumor histological type, extrathyroidal extension, lymph node involvement.

What is the implication, and what should change now?

- Well-differentiated thyroid cancer is common in reproductive age. Thus, many women could be affected before, during or after pregnancy and the exact impact of reproductive factors on tumor aggressiveness is yet to be investigated.
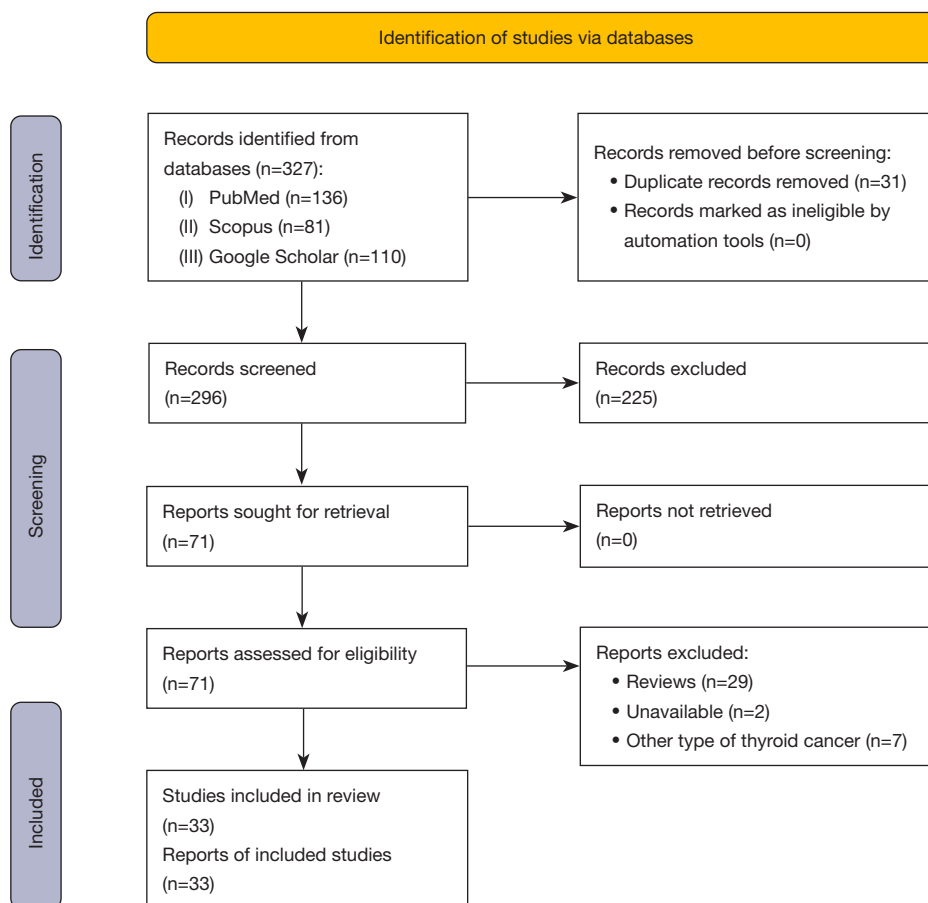
Figure 1 PRISMA flow chart of this systematic review.

performed during the whole gestational period (6). Nodules smaller than 1 cm do not require biopsy, unless high clinical or imaging suspicion is present (3). The interpretation of the results of the cytological examination is based on the Bethesda scale, which demonstrates the level of cell-malignancy, using the same criteria used for the general population.

Thyroid scintigraphy using radionuclides is absolutely contra-indicated during pregnancy (2,3). Nodules that are proved benign simply have to be monitored as in general population. In contrast, nodules of undetermined risk of malignancy can also be monitored during pregnancy, as in general they are proved to be benign (5,6).

There is not a large number of randomized control trials of DTC in pregnancy and the management of this condition lays on both multidisciplinary team and patients' decision. The aim of this review is to present the diagnostic and therapeutic strategies of thyroid cancer during pregnancy and the postpartum period. We present this article in accordance

with the PRISMA reporting checklist (available at https://gs.amegroups.com/article/view/10.21037/gs-24-52/rc).

Methods

Bibliographic research was performed using PubMed, Scopus and Google Scholar from 2011 until 2023 by two independent reviewers. The search terms employed were "differentiated thyroid cancer" AND "papillary thyroid carcinoma" AND "follicular thyroid carcinoma" AND "pregnancy" AND "gestation" AND "postpartum". Studies referring to papillary and follicular thyroid cancer (FTC) diagnosis and treatment options during pregnancy and postpartum in women >18 years old were included in our systematic review. In total, 296 articles were found, from which 225 were excluded due to irrelevant subject. In total, 71 articles were assessed for eligibility, from which 33 articles were cohort studies and case reports and were included in our systematic review. *Figure 1* shows the

PRISMA flow chart of this systematic review. An ethical approval is not required because this study is a review of the existing international literature.

Results

Table 1 displays all studies and the results of this systematic review. From the 33 included studies, 18 were retrospective cohort studies, 1 was cohort study, 2 were case control studies, 1 was meta-analysis and 11 were case reports. The primary endpoints of these studies referred to the progression and recurrence of DTC during pregnancy, the prevalence of thyroid cancer in pregnancy and the most appropriate time for surgical intervention. The disconcordance of studies' results can be explained by the

fact that there is not a large number of randomized control trials of DTC in pregnancy and the management of this condition lays on both multidisciplinary team and patients' decision.

Retrospective cohort studies

Eighteen retrospective cohort studies were included in our study. Six studies by Driouich *et al.*, Messuti *et al.*, Colombo *et al.*, Nobre *et al.*, van Velsen *et al.* and Li *et al.* included patients that were followed up for papillary thyroid cancer (PTC) during pregnancy and the impact of pregnancy on progression or recurrence was evaluated (10-15). Six studies by Ito *et al.*, Oh *et al.*, Lee *et al.*, Cabezón *et al.*, Xiao *et al.* and Nobre *et al.* referred to patients that had active

Table 1 All studies included in this review

Author	Year	Type of study	Number of cases	Endpoints
Driouich *et al.* (10)	2021	Retrospective cohort	117	No recurrence or progression of PTC if remission of cancer before conception
Messuti *et al.* (11)	2014	Retrospective cohort	340	Pregnancy has negative prognostic role for recurrence in DTC
Colombo *et al.* (12)	2022	Retrospective cohort	8	In persistent disease, no progression 12 months after delivery
Nobre *et al.* (13)	2021	Retrospective cohort	96	No disease progression during pregnancy
van Velsen *et al.* (14)	2023	Retrospective cohort	405	No disease progression even structural or biochemical during pregnancy
Li *et al.* (15)	2023	Retrospective cohort	405	No disease progression during pregnancy
Ito *et al.* (16)	2016	Retrospective	51	Increase of PTC microcarcinoma size in 8% of pregnant women
Oh *et al.* (17)	2017	Retrospective cohort	19	No clinically relevant progression of PTC was observed during pregnancy, surgery with active surveillance can be delayed
Lee *et al.* (18)	2012	Retrospective cohort	54	No difference in miRNA expression in pregnant group of PTC, PTC during pregnancy is more locoregionally aggressive, no difference in survival or recurrence
Cabezón *et al.* (19)	2013	Retrospective cohort	29	DTC detected during pregnancy has a favorable evolution, surgery could be postponed after delivery if possible
Xiao *et al.* (20)	2024	Retrospective cohort	311	No disease progression during pregnancy without surgery
Yamazaki *et al.* (21)	2022	Retrospective cohort	125	In cases of distant metastasis, no disease progression during pregnancy

Table 1 (*continued*)

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Author	Year	Type of study	Number of cases	Endpoints
Xi *et al.* (22)	2021	Retrospective cohort	124	No disease progression during pregnancy in cases of lung metastasis
Andersen *et al.* (23)	2016	Retrospective cohort	77,445	Thyroid cancer prevalence during pregnancy in Danish population was 0.001% and after pregnancy 0.02%
Liu *et al.* (24)	2015	Retrospective cohort	21	Prevalence of thyroid cancer 9.52% (2/21 cases)
Uruno *et al.* (25)	2014	Retrospective cohort	45	Surgery in second trimester is acceptable but in non-aggressive DTC surgery after delivery is recommended
Modesti *et al.* (26)	2017	Retrospective cohort	18	Surgery during pregnancy with cervical plexus block and conscious sedation is safe alternative for thyroidectomy that cannot be postponed
Boucek *et al.* (27)	2018	International cohort	35	Surgery during pregnancy has no negative impact for mother and child, but in first trimester a multidisciplinary team should evaluate the management of DTC
Sekine *et al.* (28)	2018	Cohort	227	3.3% prevalence of thyroid cancer in pregnancy
He *et al.* (29)	2021	Case control	335	Early age of first pregnancy and larger number of full-time pregnancies decrease risk of PTC
Wang *et al.* (30)	2021	Case control	2,261	Later age of first pregnancy and longer breast feeding have lower risk of PTC
Zhou *et al.* (31)	2015	Meta-analysis	406,329	Multiple pregnancies and <5 years interval between pregnancies were risk factors for thyroid cancer, while pregnancy was not risk factor for lymphatic or distant metastasis
Huang *et al.* (32)	2017	Case report	1	Skull metastasis from follicular thyroid carcinoma—surgery after delivery
Pinheiro *et al.* (33)	2019	Case report	1	Bone metastasis from follicular thyroid carcinoma diagnosed in pregnancy—surgical excision in 30-week of gestation
Lopes Rufino *et al.* (34)	2020	Case report	1	Brain metastasis from follicular thyroid carcinoma diagnosed in pregnancy
Tu *et al.* (35)	2021	Case report	1	Lymph node metastasis after follicular thyroid cancer
İsmi *et al.* (36)	2016	Case report	1	Cervical metastatic papillary thyroid carcinoma excised in 23rd week of gestation-indications for surgery according to histological type, growth speed, spread of tumor
Arnez *et al.* (37)	2019	Case report	1	Diagnosis of papillary thyroid carcinoma during pregnancy—surgery postponed after delivery—disease-free 9 years later
Paulsson *et al.* (38)	2018	Case report	1	Diagnosis of papillary thyroid carcinoma with pleomorphic tumor giant cells during pregnancy—surgery at 2nd trimester—disease-free 16 months postoperatively
Li *et al.* (39)	2020	Case report	1	Papillary thyroid carcinoma—surgical excision in 18th week of gestation
Rowe *et al.* (40)	2016	Case report	1	Metastatic DTC during pregnancy—management by multidisciplinary team
Guerrero Vásquez *et al.* (41)	2015	Case report	1	Metastatic DTC during pregnancy—management by multidisciplinary team
Murray *et al.* (42)	2012	Case report	1	Normal elevation of TSH in pregnancy—hormonal changes during pregnancy—effect on DTC surveillance

PTC, papillary thyroid cancer; DTC, differentiated thyroid cancer; TSH, thyroid-stimulating hormone.

papillary thyroid carcinomas during pregnancy without previous treatment (13,16-20). Two studies by Yamazaki *et al.* and Xi *et al.* evaluated the impact of pregnancy on distant metastasis progression (21,22). Andersen *et al.* tried to evaluate the prevalence of thyroid disease during pregnancy in Danish population, while Liu *et al.* analyzed the epidemiology of malignancies related to pregnancy (23,24). Uruno *et al.* and Boucek *et al.* suggested the optimal timing for surgery for thyroid cancer in terms of safety and efficacy and Modesti *et al.* proposed operative management for surgery during pregnancy (25-27).

Cohort studies

One study was included in this category. This study tried to find the prevalence of malignancies during pregnancy in Japanese population (28).

Case control studies

Two case control studies were included, which examined the risk factors for PTC related to reproduction in Chinese women (29,30).

Meta-analysis

One meta-analysis was included in our systematic review. The endpoints of this study were the reproductive risk factors associated with thyroid cancer and the impact of pregnancy on thyroid malignancy aggressiveness (31).

Case reports

Eleven case reports were included in our study, from which five case reports referred to cervical or distant metastasis diagnosed during pregnancy (32-36). Three case reports outlined the surgical treatment during pregnancy, while one reported surgery in postpartum (36-39). Two case reports suggested multidisciplinary team for the management of metastatic well-DTC during pregnancy (40,41). Murray *et al.* reported the hormonal changes during pregnancy and its effect on thyroid cancer surveillance regarding thyroglobulin (42).

Discussion

Progression or recurrence

The progression or recurrence of DTC during pregnancy has not been clarified in the international literature yet. Many large retrospective cohort studies disagree about the possible negative impact of pregnancy on DTC progression. A retrospective study by Ito *et al.* in 2016 with 51 subjects concluded that papillary microcarcinoma was increased in size in 8% of pregnant women (16). Cabezon *et al.* in 2013 recommended that DTC detected during pregnancy has favorable evolution and surgery should be delayed after delivery and Messuti *et al.* suggested that pregnancy has a negative prognostic role in recurrence of PTC (11,19). On the other hand, Driouich *et al.* and Oh *et al.* have published a retrospective and a cohort study with 117 and 19 subjects respectively, which showed no recurrence or progression of PTC in pregnancy if there was remission of cancer before conception and Oh *et al.* suggested delay of surgery after delivery with active surveillance (10,17). Furthermore, these results are supported by studies of Nobre *et al.* and Li *et al.*, while van Velsen *et al.* study reported 12.1% disease progression in pregnant group and 14.4% in nonpregnant group in 4.5 years follow up with no statistically significant correlation (P=0.37) and thus they described structural progression over biochemical one (13-15). What is more important is that those treated <1 year before their pregnancy and those with structural incomplete response had higher risk of progression than those with an interval >2 years and complete response to therapy (14). In agreement with these results were also the Italian study by Colombo *et al.* and the Japanese study by Yamazaki *et al.*, who reported no disease progression, in cases of persistent thyroid cancer and after the diagnosis of distant metastasis, respectively (12,21). In cases with lung metastasis, no disease progression was noted due to pregnancy (22). A recent Chinese population retrospective study found the same progression-free survival, tumor enlargement-free survival and lymph node metastasis-free survival in 2.5 years follow-up beyond pregnant and nonpregnant matched groups (20). Lee *et al.* have studied miRNA expression in PTC in general population versus pregnant group and resulted that there is no difference of expression in these two groups and no impact on recurrence or survival, but there is a negative prognostic effect on locoregional metastasis of PTC during pregnancy (18). Four case reports have been published which demonstrate metastasis of DTC during pregnancy; a brain metastasis from FTC, a bone metastasis from FTC and a skull metastasis from FTC (32-34). One case report was found referring to FTC treated 2 years before pregnancy and lymph node metastasis was diagnosed during pregnancy (35).

The time of surgical excision differed among cases but all gave birth to healthy newborns. There is lack of evidence for the management of metastatic DTC during pregnancy. This condition should be managed by multidisciplinary teams to ensure the maternal and fetal health (40,41).

Pregnancy related risk factors for DTC

Some studies have resulted that pregnancy can lower the risk for thyroid cancer occurrence. Later age of first pregnancy and longer breast feeding are preventing factors for thyroid cancer development according to Wang *et al.* (30). On the contrary, He *et al.* suggested that early age of first pregnancy, larger number of full-time pregnancies and longer breast feeding decrease the risk for PTC (29). A metanalysis by Zhou *et al.* in 2015 have shown that multiple pregnancies and <5-year interval between pregnancies can be risk factors for thyroid cancer occurrence, but pregnancy does not worsen the risk for lymphatic or distant metastasis of DTC (31).

Prevalence of DTC during pregnancy

The prevalence of thyroid cancer in pregnancy has been calculated by some studies worldwide. The most common type of pregnancy-associated thyroid cancer is PTC. Ninety to 95% of these cases are stage 1, while the majority are diagnosed in the early stage of gestation (2). Sekine *et al.* suggested a 3.3% prevalence of thyroid cancer in pregnancy in a population of 227 subjects (28). Andersen *et al.* in a retrospective cohort study in 2016 studied the prevalence of many cancer types in pregnancy in a large sample and found that thyroid cancer during pregnancy in Danish population was 0.001% and after pregnancy 0.02% (23). Liu *et al.* have calculated a prevalence of 9.52% (2 to 21 cases) but the sample was insignificant in number for confident results (21 patients) (24).

Optimal timing for surgery

The appropriate time for surgery in DTC cases in pregnancy has not been estimated yet. Some studies suggest that surgery is eligible during the second trimester of pregnancy, while others suggest surgery after delivery with active surveillance. Case reports have been published reporting surgery in different stages of gestation (36-39). A retrospective study in 2014 concludes that surgery in second trimester is acceptable but in non-aggressive cases of DTC,

surgery after delivery is recommended (25). Furthermore, Boucek *et al.* ran an international cohort study, which resulted that surgery has no negative maternal and fetal impact but in the first trimester a multidisciplinary team should manage the DTC (27). Because of uncertain toxicity of anesthetic drugs in organogenesis, surgery should be postponed for the second trimester of gestation. Based on this fact, Modesti *et al.* suggested that cervical plexus block and conscious sedation is a safe alternative for surgeries that cannot be delayed (26). Indications for surgery in DTC during pregnancy are based on the histological type, the growth speed, extrathyroidal spread, compression symptoms, suspicious lymph node or metastasis (36,43).

Adjuvant radioactive iodine (^{131}I) therapy

The majority of patients with thyroid cancer being treated with surgery will additionally receive radioactive iodine therapy in order for residual tissue to be completely destroyed (1,3,44). All patients eligible for that should be first checked for the possibility of being pregnant, because ^{131}I can penetrate the placenta and accumulates on the fetal thyroid gland, if administered before the 12th–13th week of gestation, which can cause hypothyroidism. Thus, pregnancy is an absolute contra-indication for this form of treatment and can be safely given only after delivery and breastfeeding (1,6,44). Until now, no evidence exists about infertility or compromising future attempts for childbearing concerning previous exposure to radiation (1,8). Despite that, possible fetal hypothyroidism and cognitive disorders cannot be safely excluded. As a matter of fact, it is recommended to avoid being treated with ^{131}I during pregnancy, as well as to cease breastfeeding at least 6 weeks prior to radioactive therapy. It is also advised to avoid conception for 6–12 months after treatment at minimum (1,3,8).

Substitutional therapy with levothyroxine (LT4)

Levothyroxine is given in the following situations: (I) as a therapy for the substitution of the thyroid function after total thyroidectomy; (II) as a suppressive therapy to residual disease; and (III) as a suppressive therapy to patients willing to postpone surgery until the second trimester of pregnancy or until the end of it (1).

In the case of DTCs and if surgery is planned after delivery, LT4 can be administered as a suppressive agent, starting with 50–75 μg daily and target TSH value <0.1–1 mU/L, with levels of TSH and T4 initially being

monitored monthly until the 16th–20th gestational week and then at least once between week 26 and 32, in order to prevent uncontrollable hyper- or hypothyroidism (7,9,45-47). The level of suppression should be similar to that in non-pregnant women because existing evidence does not account for side-effects of subclinical hypothyroidism on the fetus or the mother (6,8).

If the nature of the disease or the patient herself requires immediate surgical treatment during gestation, LT4 therapy should start directly postoperatively, because fetal hypothyroidism as a result of maternal inadequacy can possibly damage the cognitive development of the embryo and can also increase the chance of recurrence of the disease (1,2).

In patients who have already received therapy for DTC and then conceive, TSH values should be adjusted according to the risk for recurrence and response to treatment (48). In medium-or high-risk patients, TSH should be suppressed and remained below normal values, according to guidelines of the ATA [2005] and the European Thyroid Association (ETA) (6,48).

Newer systematic therapies

In cases of persistent advanced or metastatic DTC, newer drug agents can be considered administering post radioactive iodine treatment, such as tyrosine kinase inhibitors (TKIs) (1,6). These drugs include motesanib diphosphate, axitinib, sorafenib, sunitinib and pazopanib (1).

Sorafenib, lenvatinib and cabozantinib are Food and Drug Administration (FDA) and European Medicines Agency (EMA) approved (6). The safety of them as far as pregnancy and breastfeeding are concerned is has only been studied on lab animals, whereas FDA classifies them as category D drugs. For this reason, both FDA and EMA recommend that these drugs are not administered during pregnancy, unless absolutely vital (1). Especially FDA recommends contraception during lenvatinib treatment and avoidance of pregnancy during sorafenib treatment (49).

Prenatal screening-counseling

As made clear by a number of studies, there is a delay in conceiving among women with DTC previously being treated with ^{131}I (50). Although this is partly explained by the hazardous effect of radiation itself, this can also be attributed to the insistence of doctors for women to avoid getting pregnant for a certain period after treatment (51). On the other hand, a study of 2,360 women aged 15–39 and diagnosed with DTC, half of whom received radioactive iodine, demonstrated no significant difference for the time of first conception between the two control groups (52).

Things become more obscure about how radiation itself can affect future childbearing attempts. Most studies could not prove decrease in fertility the first year after delivery (6). One study showed latent amenorrhea or menstrual disorders in 30% of women receiving treatment, which recessed automatically a year after delivery (53). In two other studies a decrease in anti-mullerian hormone (AMH) was indicated (a sign of ovary malfunction), that returned to normal only partially after a year (54,55). Finally, another study did not suggest any differences in AMH levels between women who received ^{131}I and those who did not (56). Moreover, none of the studied previously referred to showed an increase of premature labors, mortality, spontaneous abortions, congenital defects, low weight of birth or neonatal mortality within the first year of life (6).

As far as gene monitoring is concerned, it is generally advised to seek genetic counseling for women with a mutation of the ret proto-oncogene (RET) with or without clinically prominent medullary thyroid cancer or/and MEN-2B syndrome, who wish to have offspring (6).

Conclusions

PTC is the second most common thyroid malignancy diagnosed during pregnancy and postpartum. The impact of pregnancy on aggressiveness and disease progression is still debatable. The optimal timing for surgery is disputable. Well-DTC progression seems not to be affected during pregnancy, although several hormonal changes occur. Either in cases of thyroid cancer diagnosis during pregnancy or in cases of follow-up after surgery, progression of the disease is the same as in non-pregnant women. Although surgery could be postponed in postpartum period, it could be mandatory during pregnancy regarding risk factors such as tumor histological type, extrathyroidal extension, lymph node involvement.

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Footnote

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