ORIGINAL RESEARCH

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Management of prolactinomas during pregnancy – A survey of four Canadian provinces

Abstract

Purpose: The guidelines for management of prolactinomas during pregnancy are mostly based on retrospective evidence or expert opinion. We conducted a survey to assess the current trends in management of prolactinomas during pregnancy.

Methods: A case-based electronic questionnaire was sent in January 2011 to all practicing endocrinologists, in four Canadian provinces: Nova Scotia, New Brunswick, Prince Edward Island and British Columbia with three cases of varying severity; ranging from a microprolactinomas to a large macroprolactinomas compressing the optic chiasm.

Result: There was a considerable diversity among endocrinologists with regards to monitoring and managing prolactinomas during pregnancy. In case of microprolactinomas, 94% of specialists would discontinue dopamine agonist (DA) therapy upon confirmation of pregnancy, 79% would discontinue serum prolactin measurement during pregnancy, and 94% would not perform routine pituitary imaging in the absence of new symptoms whereas 32% would perform regular formal visual field (VF) testing throughout pregnancy. In the case of macroprolactinomas, 65% chose to discontinue DA therapy upon confirmation of pregnancy, 30% would either perform regular MRI during pregnancy or, if serum prolactin was thought to be elevated out of proportion, with clinical judgment and 40% would not perform regular formal VF monitoring during pregnancy. In management of large macroprolactinomas, 82% elected to continue DA therapy whereas 18% chose surgical excision as the treatment of choice. Forty nine percent would perform regular MRI during pregnancy and 94% would perform regular formal VF monitoring during pregnancy.

Conclusion: Among endocrinologists there is considerable diversity in management of prolactinomas during pregnancy, indicating a need for better consensus and clearer guidelines.

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Prolactin producing adenomas (prolactinomas) are the most common functioning pituitary tumors, accounting for almost 40% of all pituitary adenomas [1]. These tumors are more frequently diagnosed in women during childbearing age (20-40 years) [2], probably due to an early effect of elevated prolactin, causing menstrual irregularity. Hyperprolactinemia is responsible for a third of all cases of female infertility [3] but, with adequate management, the majority of such women are expected to achieve successful pregnancies. A survey of all practicing endocrinologists was conducted in four Canadian Provinces -British Columbia (BC), Nova Scotia (NS), Prince Edward Island (PEI) and New Brunswick (NB) - to assess management practices for prolactinomas during pregnancy. This study was conducted in January 2011 prior to the publication of the 2011 Endocrine Society Clinical Practice Guidelines for diagnosis and treatment of hyperprolactinemia (2011 CPG) [4], which allowed us the unique opportunity to compare management practices across various Provinces and assess these practices against the 2011 CPG.

Methods

All practicing endocrinologists from BC, NS, NB and PEI were identified from the respective provincial physician regis-

tration authorities and an electronic link was sent to them. The survey was conducted through a questionnaire based on three clinical scenarios of varying severity of prolactinomas during pregnancy (See Appendix 1). The questionnaire was developed and disseminated using Survey Monkey. Data were analyzed using descriptive statistics.

Results

Survey respondents

A total of 60 practicing endocrinologists who represented clinical specialists involved in active management of patients with prolactinoma and represented the main centers in four Canadian provinces, were identified and sent the survey. Thirty-four (57%) responded to the questionnaire. Of these, a majority of responders (62%) were based at university hospitals, 29% were community-based solo practitioners and 9% had a community-based endocrine group practice. Whereas all participating endocrinologists reported that they saw patients with prolactinomas in their practice, 65% saw up to 5 cases, 21% between 6-10 cases, and 14% between 11-20 cases each month.

TABLE 1: Case 1

MEDICAL MANAGEMENT:	Response rate (yes) (%)
Continue current dopamine agonist therapy throughout pregnancy.	0
Discontinue cabergoline and shift to bromocriptine due to better safety data.	6
Discontinue dopamine agonist therapy as soon as pregnancy is confirmed.	94
Refer for surgical excision of the tumor.	0
Recommend therapeutic abortion.	0
BIOCHEMICAL MONITORING:	
Continue regular monitoring of serum prolactin during pregnancy.	9
Discontinue monitoring serum prolactin during pregnancy.	79
Measure serum prolactin only if patient complains of new-onset headaches and/or vision changes.	12
Local lab reports pregnancy specific prolactin reference values.	6
Serum prolactin measurement during pregnancy is a sensitive indicator of tumor volume.	9
PITUITARY IMAGING:	
Perform regular pituitary imaging during pregnancy to exclude tumor enlargement.	3
Perform pituitary imaging if serum prolactin is thought to be out of proportion with your clinical judgment.	3
Perform pituitary imaging only if patient complains of new-onset headaches and/or vision changes.	94
VISUAL FIELD TESTING:	
Perform regular formal visual field testing throughout pregnancy.	32
Perform formal visual field testing only if patient complains of new-onset headaches and/or vision changes.	59
Never perform formal visual field testing.	6
Only perform informal (clinical) visual field testing.	3

Case 1:

There was a high degree of conformity among responders regarding the medical management of Case 1 (see Table 1). A majority of specialists (94%) chose to discontinue dopamine agonist (DA) therapy as soon as pregnancy was confirmed, while 6% elected to continue bromocriptine throughout pregnancy. Although most (79%) specialists did not recommend routine monitoring of serum prolactin during pregnancy, 9% would continue to monitor routine serum prolactin during pregnancy and 12% would only check serum prolactin in case of new-onset headaches and/or vision changes. While 9% of specialists thought that serum prolactin measurement during pregnancy was a sensitive indicator of tumor volume, only 6% reported that their labs quoted pregnancy-specific prolactin values. Ninety four percent of responders indicated that they would only do pituitary imaging in case of new-onset headaches and/or vision changes whereas 3% of responders would either perform regular pituitary imaging during pregnancy to exclude tumor enlargement or perform imaging where serum prolactin was thought to be out of proportion with their clinical judgment. There was a significant diversity in the use of visual field (VF) testing with 59% indicating that they would perform standard VF testing only in case of new-onset headaches and/or vision changes while 32% would do it on a regular basis during pregnancy, 9% would either not perform any formal VF testing or perform only informal (clinical) VF testing.

Case 2:

There was greater diversity among responders regarding management of Case 2 (see Table 2). Sixty five percent of responders chose to discontinue DA therapy altogether as soon as pregnancy was confirmed, whereas 29% elected to discontinue cabergoline and shift to bromocriptine due to better safety data and 6% elected to continue cabergoline. With regards to biochemical monitoring, a majority of responders (64%) would discontinue monitoring during pregnancy whereas 24% would continue to monitor serum prolactin regularly during pregnancy and 12% would check serum prolactin only in cases of new-onset headaches and/or vision changes. Seventy percent responders indicated that they would only do pituitary imaging in case of new-onset headaches and/or vision changes while 30% would perform either regular pituitary imaging during pregnancy to exclude tumor enlargement or, in cases where serum prolactin was thought to be out of proportion, with clinical judgment. Similarly, there was significant diversity with regards to performing VF test. Sixty percent of responders reported performing standard VF regularly throughout pregnancy, whereas 37% would do it only if the patient had new-onset headaches and/or vision changes; 3% would only perform informal (clinical) VF testing only.

TABLE 2: Case 2

MEDICAL MANAGEMENT:	Response rate (yes) (%)
Continue current dopamine agonist therapy throughout pregnancy.	6
Discontinue cabergoline and shift to bromocriptine due to better safety data.	29
Discontinue dopamine agonist therapy as soon as pregnancy is confirmed.	65
Refer for surgical excision of the tumor.	0
Recommend therapeutic abortion.	0
BIOCHEMICAL MONITORING:	
Continue regular monitoring of serum prolactin during pregnancy.	24
Discontinue monitoring serum prolactin during pregnancy.	64
Measure serum prolactin only if patient complains of new-onset headaches and/or vision changes.	12
PITUITARY IMAGING:	
Perform regular pituitary imaging during pregnancy to exclude tumor enlargement.	18
Perform pituitary imaging if serum prolactin is thought to be out of proportion with your clinical judgment.	12
Perform pituitary imaging only if patient complains of new-onset headaches and/or vision changes.	70
VISUAL FIELD TESTING:	
Perform regular formal visual field testing throughout pregnancy.	60
Perform formal visual field testing only if patient complains of new-onset headaches and/or vision changes.	37
Never perform formal visual field testing.	0
Only perform informal (clinical) visual field testing.	3

TABLE 3: Case 3

MEDICAL MANAGEMENT:	Response rate (yes) (%)
Restart previous dopamine agonist therapy (Bromocriptine) throughout pregnancy.	67
Start Cabergoline due to its better efficacy.	15
Discontinue dopamine agonist therapy as soon as pregnancy is confirmed.	0
Refer for surgical excision of the tumors.	18
Recommend therapeutic abortion.	0
BIOCHEMICAL MONITORING:	
Continue regular monitoring of serum prolactin during pregnancy.	41
Discontinue monitoring serum prolactin during pregnancy.	59
Measure serum prolactin only if patient complains of new-onset headaches and/or vision changes.	0
PITUITARY IMAGING:	
Perform regular pituitary imaging during pregnancy to exclude tumor enlargement.	49
Perform pituitary imaging if serum prolactin is thought to be out of proportion with your clinical judgment.	17
Perform pituitary imaging only if patient complains of new-onset headaches and/or vision changes.	34
VISUAL FIELD TESTING:	
Perform regular formal visual field testing throughout pregnancy.	94
Perform formal visual field testing only if patient complains of new-onset headaches and/or vision changes.	6
Never perform formal visual field testing.	0
Only perform informal (clinical) visual field testing.	0

Case 3:

In management of advanced prolactinomas during pregnancy (see Table 3) most responders (82%) elected to continue medical treatment, of which 67% preferred to use bromocriptine while 15% chose cabergoline due to its better efficacy. Eighteen percent of responders chose surgical excision as the treatment of choice. Regarding biochemical monitoring through serum prolactin, 59% of specialists chose to discontinue monitoring, while 41% would prefer to continue regular serum prolactin monitoring during pregnancy. Forty nine percent would perform regular pituitary imaging to exclude tumor enlargement, whereas 34% would perform pituitary imaging only if there were new-onset headaches and/or vision changes; 17% of responders would request pituitary imaging if serum prolactin was thought to be out of proportion with clinical judgment. A majority (94%) of specialists elected to perform regular formal VF testing during pregnancy, while 6% would do formal VF testing only if new-onset headaches and/or vision changes were reported.

Discussion

The Endocrine Society has recently published clinical guidelines for diagnosis and treatment of hyperprolactinemia [4]. There were six specific recommendations regarding the management of prolactinomas during pregnancy:

1) *We recommend that women with prolactinomas be instructed to discontinue dopamine agonist therapy as soon as they discover that they are pregnant. In selected patients with macroadenomas who became pregnant on dopaminergic therapy and who have not had prior surgical or radiation therapy, it may be prudent to continue dopaminergic therapy throughout the pregnancy, especially if the tumor is invasive or is abutting the optic chiasm.*

2) *In pregnant patients with prolactinomas, we recommend against performing serum prolactin measurements during pregnancy.*

3) *We recommend against the use of routine pituitary MRI during pregnancy in patients with microadenomas or intrasellar macroadenomas unless there is clinical evidence of tumor growth such as visual field compromise.*

4) *We recommend that women with macroprolactinomas who do not experience pituitary tumor shrinkage during dopamine agonist therapy or who cannot tolerate bromocriptine or cabergoline be counseled regarding potential benefits of surgical resection before attempting pregnancy.*

5) *We recommend formal visual field assessment followed by MRI without gadolinium in pregnant women with prolactinomas who experience severe headaches and/or visual field changes.*

6) *We recommend bromocriptine therapy in patients who experience symptomatic growth of a prolactinoma during pregnancy.*

Our survey, which was conducted just before the 2011 CPG were published, suggests that while there is some homogeneity among specialists with regards to the management of uncomplicated microprolactinomas during pregnancy (Case 1), practices do vary significantly when it comes to treating more advanced prolactinomas (Cases 2 & 3). In Case 1, most specialists elected to discontinue DA therapy upon confirmation of pregnancy. This is in line with the 2011 CPG. The risk of clinically significant increase in size of microprolactinomas during pregnancy (causing headaches, optic nerve compression or stalk compression) ranges from 1.6% to 5.5% [5-7]. A study of 80 pregnancies in 56 women with microprolactinomas during pregnancy reported mild tumor enlargement in five cases on postpartum imaging, while one patient developed headaches, which disappeared when bromocriptine was restarted [8]. Although most specialists in our survey would discontinue serum prolactin measurement during pregnancy in this case, 21% would either continue to regularly monitor serum prolactin during pregnancy, or measure serum prolactin in case of new-onset headaches and/or vision changes. The 2011 CPG recommend against routine measurement of serum prolactin during pregnancy. This recommendation is based on the evidence that correlation between serum prolactin during pregnancy and tumor behavior is poor. Pregnancy is associated with physiologic hyperprolactinemia, which can be variable [9] with serum prolactin reaching levels of 150-300 $\mu\text{g/L}$ [10], thus making interpretation of levels during pregnancy unreliable. Consequently, routine measurement of serum prolactin during pregnancy should be avoided since it could lead to unnecessary imaging. In our survey, 94% of specialists reported that they would not perform routine pituitary imaging in Case 1 in the absence of new-onset headaches and/or vision changes, which is in accordance with recommendation 6.3 of the 2011 CPG. In our survey, 32% specialists would perform formal VF testing throughout pregnancy, while 59% would only perform formal VF testing if there were new onset headaches and/or vision changes. This variability in practice is perhaps due to lack of clear guidelines. Indeed the risk of clinically relevant growth of microprolactinomas during pregnancy is low, at around 2.6% [11]. The 2011 CPG do not have a specific recommendation in this regard, but do suggest urgently performing formal VF testing and a pituitary MRI in case of new or worsening headache or a change in vision. Since vision changes tend to be insidious and may not be obvious without a formal VF testing in early stages of tumor growth, it is possible that clinicians may still feel compelled to do regular VF testing during pregnancy.

In Case 2, which represented macroprolactinomas and no vision loss, 65% of specialists chose to discontinue DA therapy

as soon as pregnancy was confirmed. Although this tumor is well contained and stable, the propensity of growth during pregnancy in the absence of medical therapy is not clear from the available literature. Should tumors that had previously demonstrated a tendency for significant enlargement but have responded to medical therapy be regarded as similar to microprolactinomas in terms of their outcomes in pregnancy? It has been suggested that macroprolactinomas may be a different disease because tumours tend to be less vascular than microprolactinomas [12] and show more shrinkage with DA therapy [13]. The risk of enlargement of macroprolactinomas that have not been treated with surgery or radiotherapy is 8.9 – 32% [11,14], whereas in patients who had surgery or radiotherapy before pregnancy, the risk of symptomatic growth is around 2.5% [11]. To our mind, the 2011 CPG recommendations for medical therapy in such cases are unclear probably due to insufficient clinical evidence, and well-designed studies may be needed to further elucidate the behavior of such tumors during pregnancy. Again, measuring serum prolactin, which 36% participants in our survey would continue to perform, is not recommended for reasons discussed earlier. In our survey, 30% of specialists would either perform regular MRI during pregnancy or if serum prolactin was thought to be out of proportion with clinical judgment, and 40% would not perform regular formal VF monitoring during pregnancy. The 2011 CPG recommend against routine MRI in the absence of clinical evidence of tumor growth such as VF compromise. Doing regular formal VF assessment in each trimester, or more frequently if tumor showed evidence of suprasellar extension prior to pregnancy, is recommended [15].

Management of large macroprolactinomas with vision loss during pregnancy, as described in Case 3, is challenging. A prospective survey of 56 pregnant women with macroprolactinomas revealed a 36% risk of adverse outcomes [5] and a 75% of higher risk of visual impairment [7]. Most physicians (82%) in our survey elected to continue DA therapy, whereas 18% chose surgical excision as the treatment of choice. Indeed, the risk of further tumor enlargement in such cases is as high as 32% [14]; therefore, the 2011 CPG also recommend continuing DA therapy in case of invasive tumor especially if it is abutting the optic chiasm. The DA therapy of choice is bromocriptine, which will usually decrease the size of the adenoma and eliminate the symptoms [16]. Cabergoline is regarded as more efficacious and may be considered in case the adenoma is unresponsive to bromocriptine [17]. In our survey, 67% of specialists would prefer to use bromocriptine as the drug of choice while 15% would choose cabergoline due to its better efficacy. The available safety data on the use of bromocriptine and

cabergoline during pregnancy, although retrospectively collected, is generally reassuring. The most widely used DA therapy during pregnancy is bromocriptine, and in over 6000 reported pregnancies in women taking bromocriptine at the time of conception there was no increased risk of miscarriage or congenital malformation [11]. Similarly, another study of 2587 pregnancies in 2437 women exposed to bromocriptine during gestation did not find an increased risk of spontaneous abortion, congenital abnormalities, multiple pregnancies or post-natal development [18]. The safety data on the two other agents, cabergoline and quinagolide, are accumulating. The initial data from over 300 pregnancies in women who were exposed to cabergoline and almost 200 who were exposed to quinagolide during pregnancy reported no adverse effects on the pregnancy or fetal development [19,20]. Follow-up data of 107 infants exposed to cabergoline during pregnancy indicated no subsequent neonatal physical or mental abnormality [21]. Several recent studies are also reassuring and have reported no maternal-fetal complications in pregnancies exposed to cabergoline [17,22,23]. Eighteen percent of specialists in our survey chose surgical excision as the treatment of choice for Case 3. Ideally, surgery is recommended before pregnancy in tumors that are resistant to medical treatment [24]. The 2011 CPG recommend that women with macroprolactinomas, who do not experience pituitary tumor shrinkage with DA therapy or who cannot tolerate DA therapy, be counseled regarding the potential benefits of surgical resection before attempting pregnancy [4]. Furthermore, there have been cases of tumour enlargement during pregnancy even after surgery [25]. Emergency pituitary surgery during pregnancy is associated with significant morbidity for mother (blood loss, hypopituitarism, etc.) and mortality for fetus (1.5- and 5-fold increase in fetal loss during the first and second trimesters, respectively) [26].

For Case 3 in our survey, 49% of specialists would perform regular MRI during pregnancy, whereas 51% would perform pituitary MRI only if there were new onset symptoms, or if serum prolactin was thought to be out of proportion with clinical judgment; 94% would perform regular formal VF monitoring during pregnancy. The 2011 CPG do not have a specific recommendation in this regard, but do suggest urgently performing formal VF testing and a pituitary MRI in case of new or worsening headache or a change in vision. Due to a significant risk of vision loss and tumor enlargement, endocrinologists typically perform regular VF testing during pregnancy and would consider MRI monitoring of the tumor during pregnancy.

In summary, our survey has shown conformity of approach in management of microprolactinomas during pregnancy but

the management of large prolactinomas during pregnancy is quite diverse. The 2011 CPG provide broad guidelines on management of prolactinomas during pregnancy but need to be more specific in certain areas and recommend studies in areas where evidence is lacking. The limitations of our study are its small sample size and that the data are based on practicing physicians from only four provinces; however, its major strength is that it reflects a wide representation of practicing physicians, including solo and community based practitioners as well as those practicing in university hospitals.

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Appendix 1. How Do You Manage Prolactin Secreting Pituitary Tumors In Pregnancy?

YOU CAN PICK MORE THAN ONE OPTION FROM THE GIVEN CHOICES

Case 1

Ms. Doucette is 24 years old and was seen for inability to conceive. Her initial screen results showed an elevated prolactin level of 64 µg/L (normal level is 2 to 15 µg/L). A subsequent MRI scan confirmed the presence of a 5mm pituitary adenoma. She was given Bromocriptine, which normalized her menstruation as well as her prolactin level. One year ago she asked if she could start Cabergoline instead because of its less frequent dosage. She was shifted to Cabergoline 0.5 mg twice a week and her prolactin levels have remained normal. She called your office yesterday to inform you that she was pregnant.

How would you manage this patient?

Medical management:

1. Continue current dopamine agonist therapy throughout pregnancy (Yes/No)
2. Discontinue Cabergoline and shift to Bromocriptine due to better safety data (Yes/No)
3. Discontinue dopamine agonist therapy as soon as pregnancy is confirmed (Yes/No)

4. Refer for surgical excision of the tumour (Yes/No)

5. Recommend therapeutic abortion (Yes/No)

Biochemical monitoring:

1. Continue regular monitoring of serum prolactin during pregnancy (Yes/No)
2. Discontinue monitoring serum prolactin during pregnancy (Yes/No)
3. Measure serum prolactin only if patient complains of new-onset headaches and/or vision changes (Yes/No).

Pituitary imaging:

1. Perform regular pituitary imaging during pregnancy to exclude tumour enlargement (Yes/No)
2. Perform pituitary imaging if serum prolactin is thought to be out of proportion with your clinical judgment (Yes/No)
3. Perform pituitary imaging ONLY if patient complains of new-onset headaches and/or vision changes (Yes/No)

Visual field testing:

1. Perform regular formal (Goldmann or Humphrey) visual field testing throughout pregnancy (Yes/No)
2. Perform formal visual field testing only if patient complains of new-onset headaches and/or vision changes (Yes/No)
3. Never perform formal visual field testing (Yes/No)
4. Only perform informal (clinical) visual field testing (Yes/No)

Case 2

Mrs. Saha, a 37-year-old musician, had originally presented with milky breast discharge about 5 years ago. Subsequent investigations revealed an elevated prolactin level of 654 µg/L (normal level is 2-15 µg/L). Pituitary MRI confirmed a 2.1cm pituitary macroadenoma. Visual field testing revealed a defect in her left superior temporal field. She was started immediately on Cabergoline 1.0 mg twice a week, and within 6 months, her serum prolactin level returned to normal, and her tumor shrank to 1.2 cm. Her visual field test results were normal. She has been under yearly surveillance and her serum prolactin level has remained normal. Mrs. Saha is now 4 weeks pregnant.

How would you manage this patient?

Medical management:

1. Continue current dopamine agonist therapy throughout pregnancy (Yes/No)
2. Discontinue Cabergoline and shift to Bromocriptine due to better safety data (Yes/No)
3. Discontinue dopamine agonist therapy as soon as pregnancy is confirmed (yes/No)
4. Refer for surgical excision of the tumour (yes/No)
5. Recommend therapeutic abortion (yes/No)

Biochemical monitoring:

1. Continue regular monitoring of serum prolactin during pregnancy (Yes/No)
2. Discontinue monitoring serum prolactin during pregnancy (Yes/No)
3. Measure serum prolactin only if patient complains of new-onset headaches and/or vision changes (Yes/No).

Pituitary imaging:

1. Perform regular pituitary imaging during pregnancy to exclude tumor enlargement (Yes/No)
2. Perform pituitary imaging if serum prolactin is thought to be out of proportion with your clinical judgment (Yes/No)
3. Perform pituitary imaging ONLY if patient complains of new-onset headaches and/or vision changes (Yes/No)

Visual field testing:

1. Perform regular formal (Goldmann or Humphrey) visual field testing throughout pregnancy (Yes/No)
2. Perform formal visual field testing only if patient complains of new-onset headaches and/or vision changes (Yes/No)
3. Never perform formal visual field testing (Yes/No)
4. Only perform informal (clinical) visual field testing (Yes/No)
5. Other _____

Case 3

Ms. Wong, a 30-year-old nulliparous realtor, is 10 weeks pregnant. She was told 6 years ago that she had a large prolactinoma and was given Bromocriptine. She last saw her specialist more than 3 years ago. She has been filling her prescription through her family physician and takes her medication intermittently. Her menstruation has always been irregular and when she started gaining weight 2 weeks ago she did the pregnancy test, which was positive. This was later confirmed by her family physician. She thinks she last took her Bromocriptine about 3 months ago. When you examined her, she had bitemporal hemianopia on clinical visual field testing and you requested an urgent MRI which showed a 2.9 cm sellar tumor compressing the optic chiasm. Her serum prolactin level was 2400 µg/L.

How would you manage this patient?

Medical management:

1. Restart previous dopamine agonist therapy (Bromocriptine) throughout pregnancy (Yes/No)
2. Start Cabergoline due to its better efficacy (Yes/No)
3. Discontinue dopamine agonist therapy as soon as pregnancy is confirmed (Yes/No)
4. Refer for surgical excision of the tumour (Yes/No)
5. Recommend therapeutic abortion (Yes/No)

Biochemical monitoring:

1. Continue regular monitoring of serum prolactin during pregnancy (Yes/No)
2. Discontinue monitoring serum prolactin during pregnancy (Yes/No)
3. Measure serum prolactin only if patient complains of new-onset headaches and/or further worsening of vision (Yes/No).

Pituitary imaging:

1. Perform regular pituitary imaging during pregnancy to exclude tumour enlargement (Yes/No)
2. Perform pituitary imaging if serum prolactin is thought to be out of proportion with your clinical judgment (Yes/No)
3. Perform pituitary imaging ONLY if patient complains of headaches and/or further worsening of vision (Yes/No)

Visual field testing:

1. Perform regular formal (Goldmann or Humphrey) visual field testing throughout pregnancy (Yes/No)
2. Perform formal visual field testing only if patient complains of headaches and/or further worsening of vision (Yes/No)
3. Never perform formal visual field testing (Yes/No)
4. Only perform informal (clinical) visual field testing (Yes/No)

Please tell us a little bit about your practice

Which of the following best describes your practice?

- a) Community-based solo endocrine practice
- b) Community based group endocrine practice
- c) University hospital based endocrine practice
- d) Other_____

How many prolactinoma patients you see in an average month?

- a) 0-5
- b) 6-10
- c) 11-20
- d) >20