2. Klein CJ, Boes CJ, Chapin JE, et al. Adult polyglucosan body disease: case description of an expanding genetic and clinical syndrome. *Muscle Nerve* 2004;**29**:323–8.
3. Boulan-Predseil P, Vital A, Brochet B, et al. Dementia of frontal lobe type due to adult polyglucosan body disease. *J Neurol* 1995;**242**:512–6.
4. Rifai Z, Klitzke M, Tawil R, et al. Dementia of adult polyglucosan body disease. Evidence of cortical and subcortical dysfunction. *Arch Neurol* 1994;**51**:90–4.
5. Robertson NP, Wharton S, Anderson J, et al. Adult polyglucosan body disease associated with an extrapyramidal syndrome. *J Neurol Neurosurg Psychiatry* 1998;**65**:788–90.
6. Rey A. L'examen psychologique dans les cas d'encéphalopathie traumatique. *Archives de Psychologie* 1941;**28**:286–340.
7. Klatka LA, Schiffer RB, Powers JM, et al. Incorrect diagnosis of Alzheimer's disease: A clinicopathologic study. *Arch Neurol* 1996;**53**:35–42.

doi:10.1016/j.jocn.2006.03.001

Isolated intrasellar tuberculoma mimicking pituitary adenoma

Selcuk Yilmazlar [a,*], Ahmet Bekar [a], Ozgur Taskapilioglu [a], Sahsene Tolunay [a,b]

[a] *Department of Neurosurgery, School of Medicine, Uludag University, Gorukle Kampus, Bursa 16059, Turkey*
[b] *Department of Pathology, School of Medicine, Uludag University, Bursa, Turkey*

Received 22 December 2005; accepted 31 January 2006

Abstract

A 37-year-old woman presenting with galactorrhea and menstrual irregularity due to an intrasellar lesion of the pituitary gland underwent transsphenoidal surgery for histopathological diagnosis and removal of the lesion. Histological findings were consistent with a tuberculoma. The post-operative course was satisfactory with resolution of galactorrhea and improved ovulatory cycle. The patient was successfully treated with a combination of surgical resection and anti-tuberculous therapy for one year, which resulted in hormonal and tuberculosis control. This patient appears unique regarding the location of the lesion and the dramatic response to surgical treatment. Although differential diagnosis of inflammatory pathologies of the intrasellar region presents difficulties, this patient demonstrates that tuberculoma should be considered.
© 2006 Elsevier Ltd. All rights reserved.

Keywords: Sellar; Pituitary; Tuberculosis

1. Introduction

Differential diagnosis of nonadenomatous lesions of the pituitary gland remain a challenge. Even when state-of-the-art neuroradiological techniques including magnetic resonance imaging (MRI) with proton MR spectroscopy and diffusion-weighted (DW) imaging[1] are used, inflammatory lesions of the pituitary still present diagnostic challenges. The most frequent inflammatory pathologies of the pituitary are lymphocytic and granulomatous hypophysitis, Langerhans histiocytosis, Wegener's granulomatosis, sarcoidosis, and bacterial and parasitic infections.[2,3] Precise determination of the pathology has diagnostic, therapeutic, and prognostic relevance.

We present a patient with an intrasellar inflammatory pituitary lesion, extending to the pituitary stalk. After histopathological investigation of the specimen and laboratory results, a diagnosis of intrasellar tuberculoma was made.

Intrasellar tuberculomas are rare, especially with wide usage of anti-tuberculous therapy and they constitute 0.15–4.00% of all intracranial mass lesions.[4] Coleman and Meredith first reported an intrasellar tuberculoma in 1940 and since then most affected patients have been adults from developing countries.[5] Isolated intrasellar tuberculoma may exist without systemic tuberculosis and diagnosis can be delayed if it presents only with endocrine abnormalities. In this case, transsphenoidal removal of the tuberculoma resulted in immediate clinical and endocrinological improvement. The reported case is unique due to the isolated intrasellar location of the lesion and its response to surgical therapy.

2. Case report

A 37-year-old woman with one child was admitted to our hospital with the complaints of galactorrhea, and menstrual irregularity (prolactin: 64.3 ng/mL; thyroid stimulating

* Corresponding author. Tel.: +90 224 4428081; fax: +90 224 4428034/29263.
E-mail address: selsus@uludag.edu.tr (S. Yilmazlar).

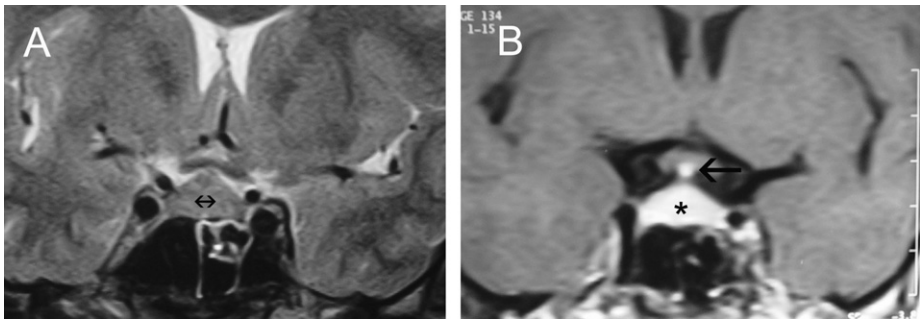

Fig. 1. Preoperative coronal MRI. (A) T2-weighted image without contrast and (B) diffuse pathological enhancement on T1-weighted image with contrast *. Note the thickening of the pituitary stalk and enhancement with contrast material (arrow).

hormone [TSH]: 0.12 IU/mL; free T4: 1.03 ng/dL; fT3: 4.1 pg/ml; follicle stimulating hormone [FSH]: 1.86 mIU/mL; luteinizing hormone [LH]: 0.48 mIU/mL: estradiol: 65.0 pg/mL; progesterone: 0.39 ng/mL). She was given cabergoline 0.25 mg twice a week by the Endocrinology Department and surgery was recommended for her sellar lesion. At admission to our department, her physical and neurological examinations were normal. There was no lymphadenopathy. Hormonal assessment revealed low prolactin levels (1.1 ng/mL) indicating suppression with therapy. Other hormone levels were as follows: free T3, 1.8 pg/mL; free T4, 0.52 ng/mL; FSH, 4.54 mIU/mL; LH, 3.18 mIU/mL; estradiol 48.0 pg/mL; progesterone 0.46 ng/mL; cortisol 9.0 μg/dL. Chest X-ray was normal and her cranial X-rays showed an enlarged sella. Sellar MRI revealed a homogenous enhanced lesion that filled the sella (Fig. 1). She was operated by a transnasal–transsphenoidal approach and a yellowish-white, hard mass was removed with its hard capsule. Her post-operative MRI showed total exclusion of the mass. Her menstrual bleeding surprisingly started 3 days after the surgery. Post-operative hormonal evaluation was as follows: prolactin, 0.3 ng/mL; free T3, 0.78 ng/mL, free T4, 1.04 ng/dL; FSH, 1.97 mIU/mL; LH, 1.21 mIU/mL; cortisol, 0.8 μg/dL. She was not given hormone replacement therapy during the post-operative period. Histopathological examination revealed replacement of normal pituitary tissue by an active inflammatory infiltrate with multiple granulomas comprising Langerhans' giant cells with necrosis, surrounded by lymphocytes and plasma cells which suggested tuberculoma (Fig. 2). Ziehl-Neelsen staining was negative. Her intradermal reaction to tuberculin test was 25 mm and therefore, a treatment regimen consisting of isoniazid, rifampin and morphosinamid was instituted. The patient regained her regular menstrual cycle pattern within 2 years, her post-operative hormone levels reached normal limits, and MRI showed no abnormality (Fig. 3).

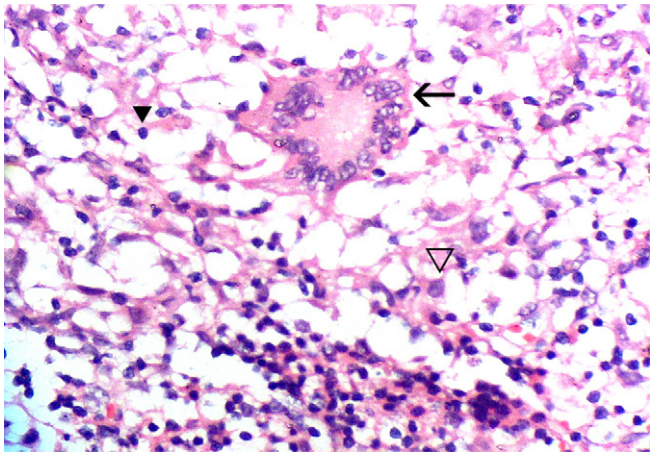

Fig. 2. The section shows granulomatous inflammation, Langerhans' giant cells (arrow), epithelioid cell (open arrow head) with necrosis surrounded by lymphocytes (arrow head).

3. Discussion

Radiological images of central nervous system tuberculosis generally demonstrate enhancement of basal cisterns, granulomatous inflammatory lesions, calcification, ventricular dilatation and meningeal enhancement and may rarely involve tissues in the sellar region. Tuberculous granulomas have reasonably specific morphology on MRI.[1] However, isolated intrasellar masses of different etiologies may be difficult to differentiate using MRI alone. Inflammatory lesions of the pituitary consist of a heterogeneous group including bacterial lesions and non-bacterial lesions with an immunological origin.[6–8] A range of diagnostic procedures including a transsphenoidal biopsy are necessary to provide an accurate diagnosis, which, in the case of infectious or inflammatory etiology, may lead to an efficient medical therapy. In this case, clinical and laboratory findings were not specific enough to reach a definite diagnosis. MRI did not rule out pituitary adenoma. Tuberculosis, considering the medical history of the patient, did not appear to be a likely diagnosis, and additional investigations including thoracic CT, purified protein derivative test and others seemed to exclude this possibility. With the current prevalence of tuberculosis, the incidence of intracranial tuberculoma is high among inflammatory mass lesions of the central nervous system.[7,9]

Tuberculoma usually involves the cerebrum and leptomeningeal structures adjacent to the skull base, but an isolated infiltration may occur in the pituitary rarely. Tuberculoma in the suprasellar region has been reported in 21.4% of symptomatic central nervous system tuberculomas.[10] Tuberculoma in the sellar region has been reported

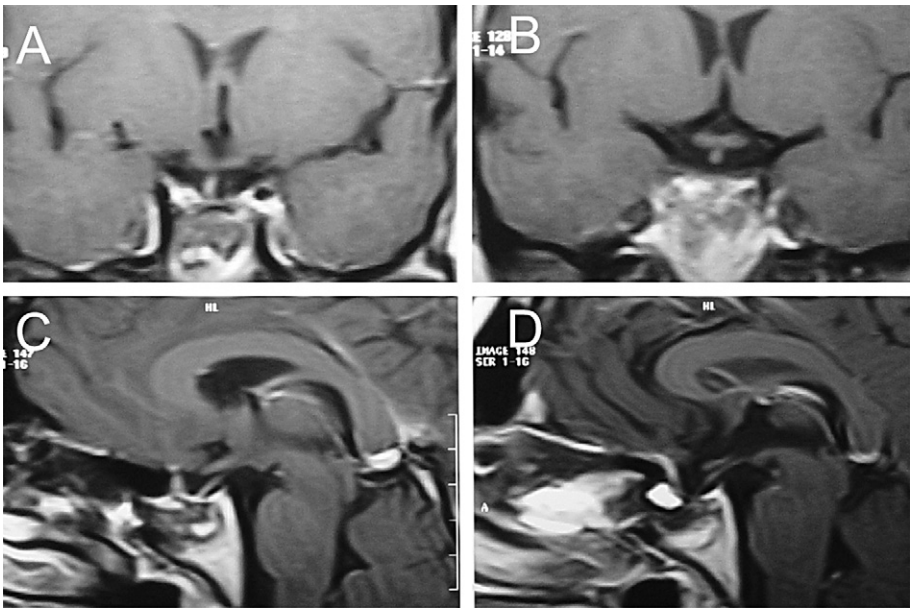

Fig. 3. Postoperative coronal (A,B) and sagittal (C,D) T1-weighted MRI with contrast. Note the normal appearance of the pituitary stalk and diaphragma sella.

to occur in 1.4% of patients with pituitary lesions in a large series.[11] Surprisingly, all the patients with intrasellar tuberculoma are female and the ones of child-bearing age presented with amenorrhea. Several cases of intrasellar tuberculoma of the pituitary with general central nervous system involvement (such as tuberculous meningitis or cerebral tuberculoma) have been reported.[10] Only four of these patients suffered from pituitary insufficiency.[5] Review of the literature reveals at least 12 isolated cases of intrasellar tuberculoma without systemic involvement (Table 1).[5,11,13–15,17,18,23–26] To the best of our knowledge, only one case of isolated intrasellar tuberculoma with pituitary insufficiency has been reported.[12] However, our patient is unique with regard to the intrasellar location of the lesion mimicking pituitary adenoma and the dramatic response to surgical resection. After her hormonal status returned to normal, our patient did not remain dependent on hormone replacement. The excellent response to surgical therapy observed in our patient was due to immediate relief of mass effect on the normal pituitary gland.

Preoperative confirmative studies remain a challenge. Even if suggestive of a tuberculoma, these are not conclusive, as often the case with granulomatous lesions (Table 1). To our knowledge, combined pituitary adenoma and intrasellar tuberculoma has also been reported in two cases.[11,13] The absence of bacteria in CSF and the specimen, does not exclude tuberculoma.[13,14] A female predominance is reported.[5] Headache and visual disturbances are the most common presenting complaints and this may be the result of diaphragma sella traction.[5] Sarcoidosis, syphilis and other granulomatous inflammations must be considered in the differential diagnosis. Sarcoidosis of the pituitary is very rare and its manifestations are arachnoiditis with scarring and granulomatous involvement of the suprasellar pituitary region.[2] Syphilis may occur as a gummatous lesion or a diffuse inflammatory reaction. Fungal infections of the pituitary gland may be caused by histoplasmosis and cocydiosis, usually in association with immunosuppression, or with sinonasal infections. These inflammations can be excluded by the absence of systemic lesions. Giant cell granuloma is a granulomatous disease with unknown mechanisms affecting the pituitary gland in adult populations. It consists of noncaseating giant cell granulomas which may attack the whole pituitary gland and consequently lead to fibrosis.[27] The only radiological feature suggestive of intrasellar tuberculoma may be the thickening of the pituitary stalk on MRI, but this can also be seen in other inflammatory conditions.[6,15] Thickening of the pituitary stalk on MRI is well described, especially in germinomas, sarcoidosis, infections and histiocytosis. The majority of these lesions may involve the hypothalamus, pituitary stalk and posterior lobe by tissue infiltration and extensive destruction and may cause hypopituitarism.[16] Thickening of the pituitary stalk in intrasellar tuberculoma is a common radiological finding[14,15,17,18] and the differential diagnosis includes dissimilar pathologies with widely variable therapeutic options such as benign inflammations, infections, Langerhans cell histiocytosis, germinoma or systemic malignancies.[19–22] Sellar tuberculomas may produce symptoms of mass lesions, usually without signs of infection, and are generally secondary to hematogenous spread or direct contamination from paranasal sinuses, but mechanisms are still unclear.[5] In our patient, there was no history that could imply the hematogenous spread or pulmonary tuberculosis.

In conclusion, intrasellar tuberculoma should be distinguished from other granulomatous sellar lesions. The radiological diagnosis of this isolated lesion is difficult. We

Table 1
Isolated cases of intrasellar tuberculoma without systemic involvement reported in the literature

No.	Author/year	Age/ gender	Clinic presentation	Radiological appearance	Intraoperative appearance/type of surgery	Pre-op hormonal status	Post-op hormonal status	Post-op hormone replacements	Follow up result[a]
1.	Esposito et al./1987[23]	54/F	Headache,	Intrasellar mass	Grayish yellow lesion/total removal	Normal	Normal	No	18 months/ asymptomatic
2.	Delsedime et al./1988[24]	45/F	Headache, amenorrhea, deafness	Intrasellar mass	Biopsy	Prolactin increased	Same as pre-operative level	Yes	12 months/ symptomatic
3.	Ghosh et al./ 1992[25]	35/F	Headache, vomiting, amenorrhea, galactorrhea	Intrasellar contrast enhancing mass	Grayish-yellow, avascular/total removal	Prolactin increased	NA	No	6 months/ asymptomatic
4.	Pereira et al./1995[15]	55/F	Headache, VI. nerve palsy	Intrasellar mass and thickened infundibulum and pituitary stalk	White, nonbleeding, fibrous nodule/total removal	Normal	Normal	No	18 month/ asymptomatic
5.	Ashkan et al./1997[14]	33/F 31/F	Headache, amenorrhea, fatigue, weight loss	Intrasellar masses extending up the pituitary stalk, which was thickened	NA/biopsy NA	Panhypopituitarism Panhypopituitarism	NA NA	No No	12 months/ asymptomatic 12 months/ asymptomatic
6.	Petrossians et al./1998[18]	54/F	Headache, vomiting	Intrasellar mass and thickened pituitary stalk	Debulking of the tumor	Anterior hypopititarism and mild diabetes insipidus	Required hormone replacement	Yes	5 year/ asymptomatic
7.	Gazioglu et al./1999[13]	34/F	Acromegaly, oligomenorrhea, hypertrichosis	Intrasellar tuberculoma with intrasellar- pituitary adenoma	No difference between adenoma and tuberculoma/ total removal	Prolactin and growth hormone increased	Prolactin and growth hormone mildly elevated otherwise normal	No	2 year/ asymptomatic
8.	Sinha et al./ 2000[17]	27/F	Headache, amenorrhea,	Intrasellar mass and thickened pituitary stalk	Greyish, firm, fairly vascular, and nonsuctionable/ subtotal removal	Normal			18 months/ amenorrhea
9.	Sharma et al./2000[5]	25/F	Galactorrhea, headache	Intrasellar mass	NA/total removal	Prolactin increased	NA	NA	2 year
10.	Sharma et al./2001[11]	24/F	Acromegaly, amenorrhea	Isolated intrasellar tuberculoma and composite sellar-supra/parasellar pituitary adenoma	NA/total removal	Growth hormone increased	NA	NA	18 months/ asymptomatic
11.	Paramo et al./2002[26]	32/F	Headache, amenorrhea, asthenia	Intrasellar mass with deviation of the pituitary stalk	Grayish-yellow lesion of rubbery consistency/total removal	Low baseline level, Hypopituitarism?	Same as preoperative levels	No	9 months/ asymptomatic
12.	Present case (2005)	37/F	Galactorrhea and irregularity in ovulatory cycle	Homogenous lesion that filled sella	Yellow-white, hard mass/total removal	Low prolactin level (treated)	Normal	No	24 months/ asymptomatic

[a] All of the patients received three or four drug regimens of anti-tuberculous therapy for nine– eighteen months. NA = not available, not mentioned in report.

recommend obtaining histological diagnosis to exclude malignant, granulomatous or infectious lesions when other investigations are inconclusive. The distinction between bacterial inflammatory and non-bacterial inflammatory lesions in non-adenomotous pathologies is crucial, as corticosteroid treatment is efficient in most cases of non-bacterial inflammatory-type lesions, whereas it is contraindicated in acute tuberculosis. Surgery may play a role in alleviating endocrinopathy.

References

1. Shar GV. Central nervous system tuberculosis: Imaging manifestations. *Neuroimaging Clin N Am* 2000;**10**:355–74.
2. Rubin MR, Bruce JN, Khandji AG, et al. Sarcoidosis within a pituitary adenoma. *Pituitary* 2001;**4**:195–202.
3. Hansen I, Petrossians P, Thiry A, et al. Extensive inflammatory pseudotumor of the pituitary. *Clin Endocrinol Metab* 2001;**86**:4603–10.
4. DeAngelis LM. Intracranial tuberculoma: case report and review of the literature. *Neurology* 1981;**31**:133–6.
5. Sharma MC, Arora R, Mahapatra AK, et al. Intrasellar tuberculoma- an enigmatic pituitary infection: a series of 18 cases. *Clin Neurol Neurosurg* 2000;**102**:72–7.
6. Chandy MJ. Thickening of the pituitary stalk: suggestive of intrasellar tuberculoma. *Neurosurgery* 1995;**37**:1232–3.
7. Rohmer V, Chanson P, Dupas B, et al. Intra-sellar non-adenomatous expansive process. *Ann Endocrinol (Paris)* 1997;**58**:11–9.
8. Capra M, Wherrett D, Weitzman S, et al. Pituitary stalk thickening and primary central nervous system lymphoma. *J Neurooncol* 2004;**67**:227–31.
9. Kaminogo M, Ishimaru H, Morikawa M, et al. Proton MR spectroscopy and diffusion-weighted MR imaging for the diagnosis of intracranial tuberculomas. A report of two cases. *Neurol Res* 2002;**24**:537–43.
10. Unal A, Sutlas PN. Clinical and radiological features of symptomatic central nervous system tuberculomas. *Eur J Neurol* 2005;**12**:797–804.
11. Sharma MC, Vaish S, Arora R, et al. Composite pituitary adenoma and intrasellar tuberculoma: Report of a rare case. *Pathol Oncol Res* 2001;**7**:74–6.
12. Brooks MH, Dumlao JS, Bronsky D, et al. Hypophysial tuberculoma with hypopituitarism. *Am J Med* 1973;**54**:777–81.
13. Gazioglu N, Ak H, Oz B, et al. Silent pituitary tuberculoma associated with pituitary adenoma. *Acta Neurochir (Wien)* 1999;**141**:785–6.
14. Ashkan K, Papadopoulos MC, Casey AT, et al. Sellar tuberculoma: report of two cases. *Acta Neurochir (Wien)* 1997;**139**:523–5.
15. Pereira J, Vaz R, Carvalho D, et al. Thickening of the pituitary stalk: A finding suggestive of intrasellar tuberculoma? Case report. *Neurosurgery* 1995;**36**:1013–6.
16. Leger J, Velasquez A, Garel C, et al. Thickened pituitary stalk on magnetic resonance imaging in children with central diabetes insipidus. *J Clin Endocrinol Metab* 1999;**84**:1954–60.
17. Sinha S, Singh AK, Tatke M, et al. Hypophyseal tuberculoma: direct radiosurgery is contraindicated for a lesion with a thickened pituitary stalk: case report. *Neurosurgery* 2000;**46**:735–8.
18. Petrossians P, Delvenne P, Flandroy P, et al. An unusual pituitary pathology. *J Clin Endocrinol Metab* 1998;**10**:3454–8.
19. Prosch H, Grois N, Bokkerink J, et al. Central diabetes insipidus: Is it Langerhans cell histiocytosis of the pituitary stalk? A diagnostic pitfall. *Pediatr Blood Cancer* 2005;**45**:802–7.
20. Leger J, Velasquez A, Garel C, et al. Thickened pituitary stalk on magnetic resonance imaging in children with central diabetes insipidus. *J Clin Endocrinol Metab* 1999;**84**:1954–60.
21. Capra M, Wherrett D, Weitzman S, et al. Pituitary stalk thickening and primary central nervous system lymphoma. *J Neurooncol* 2004;**67**:227–31.
22. Fassett DR, Couldwell WT. Metastases to the pituitary gland. *Neurosurg Focus* 2004;**15**:E8.
23. Esposito V, Fraioli B, Ferrante L, et al. Intrasellar tuberculoma. Case report. *Neurosurgery* 1987;**21**:721–3.
24. Delsedime M, Aguggia M, Cantello R, et al. Isolated hypophyseal tuberculoma: Case report. *Clin Neuropathol* 1988;**7**:311–3.
25. Ghosh S, Chandy MJ. Intrasellar tuberculoma. Case report. *Clin Neurol Neurosurg* 1992;**94**:251–2.
26. Paramo C, de la Fuente J, Nodar A, et al. Intrasellar tuberculoma - A difficult diagnosis. *Infection* 2002;**30**:35–7.
27. Honegger J, Fahlbusch R, Bornemann A, et al. Lymphocytic and granulomatous hypophysitis: experience with nine cases. *Neurosurgery* 1997;**40**:713–22.

doi:10.1016/j.jocn.2006.01.033

Skull metastasis of thyroid papillary carcinoma

Satoru Miyawaki [a], Ryuichi Yamazaki [b], Takehiko Harada [b], Shigehiko Takanashi [a], Tadashi Nagashima [a], Hiroshi Nakaguchi [a], Ryo Okazaki [c], Kazuhito Yamazaki [d], Yasuo Ishida [d], Akira Matsuno [a,*]

[a] *Department of Neurosurgery, Teikyo University Ichihara Hospital, 3426–3 Anesaki, Ichihara City, Chiba 299-0111, Japan*
[b] *Department of Otolaryngology, Teikyo University Ichihara Hospital, Chiba, Japan*
[c] *Department of 3rd Internal Medicine, Teikyo University Ichihara Hospital, Chiba, Japan*
[d] *Department of Pathology, Teikyo University Ichihara Hospital, Chiba, Japan*

Received 20 November 2005; accepted 31 January 2006

* Corresponding author. Tel.: +81 436 62 1211x2621; fax: +81 436 62 1357.
E-mail address: akirakun@med.teikyo-u.ac.jp (A. Matsuno).