Glomus Tumor: a Clinical and Histopathologic Analysis of 17 Cases

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Background **: Glomus tumor is a benign neoplasm derived from the normal glomus body. This tumor includes the following types; solitary, multiple, proliferating, and acral arteriovenous. Histologically, it was subdivided into solid type, glomangioma, and glomangiomyoma. Its malignant counterpart - glomangiosarcoma - was reported.**

Objectives **: The purposes of this study were aimed to evaluate the clinical and pathologic presentations of glomus tumor.**

Methods **: A total of 17 patients who have been diagnosed with glomus tumor by histopathologic examination were reviewed.**

Results **: Male patients were ten and female patients were seven. The age of the onset of glomus tumor varied from birth to 61 years. The location of tumors were as follows: arm (7 cases), finger (6 cases), back (2 cases), leg (1 case), foot (1 case). The digit was the most common site for female patients. Clinical manifestations showed solitary bluish papule (6 cases), subcutaneous nodule (5 cases), nail discoloration (3 cases), nail dystrophy (1 case), bluish plaque (1 case). One patient had no specific lesion but tenderness. The most characteristic symptom was pain in 15 (88.2%) of the 17 patients, and the other two patients had no symptom. Two asymptomatic lesions were located on the forearm and histopathologically showed glomangioma. Histopathologically, 13 (76.5%) of the 17 patients classified as solid type, and 4 (23.5%) the glomangioma variety.**

Conclusion **: Glomus tumors were most commonly seen as a painful nodule on the upper extremity and especially female patients showed predilection for subungual location. We speculate that multiple, mild symptomatic lesions might be a tendency to be glomangioma.**

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Key Word : Glomus tumor, Glomangioma, Clinical, Histopathologic

Glomus tumor is a benign neoplasm of neuromyo-arterial glomus composed of vascular channels surrounded by proliferating glomus cells and nerve fibers. This tumor is relatively uncommon and it can occur at any age and at any anatomical site, with a predilection for the subungual region, but multiple tumors are ten times more frequent in children than in adults[1,2]. This tumor can be divided as the following types : solitary, multiple, proliferating and acral arteriovenous type. Multiple glomus tumors are subdivided into disseminated, regional, congenital plaque-like type[3]. The common clinical presentation is usually a painful, tender nodule.

There is a wide variation in histological appearance, with three main types being described : solid form, glomangioma, glomangiomyoma[1,2].

In this study, we aimed to observe the clinical and pathologic features of glomus tumors and to

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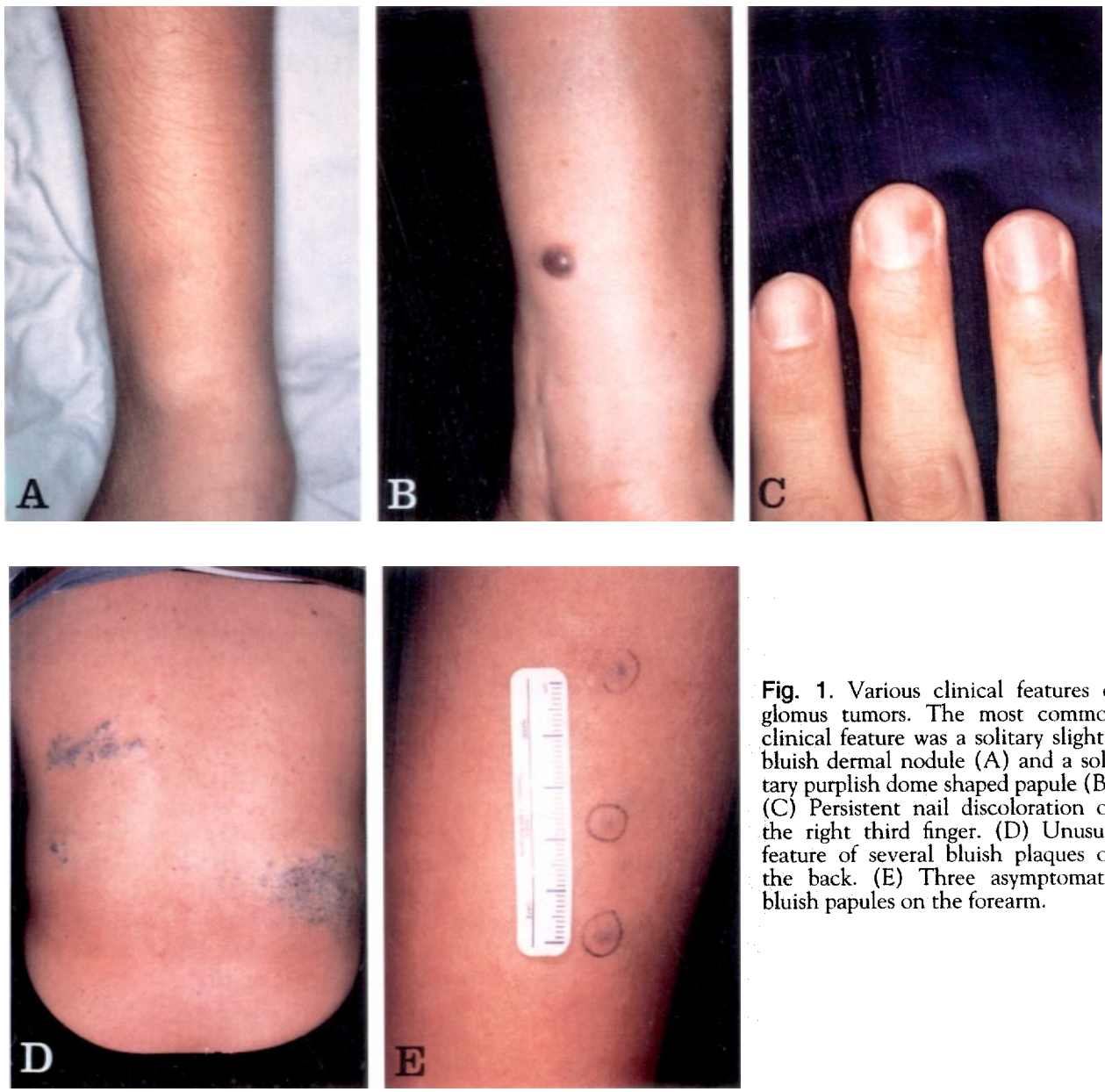

Fig. 1. Various clinical features of glomus tumors. The most common clinical feature was a solitary slightly bluish dermal nodule (A) and a solitary purplish dome shaped papule (B). (C) Persistent nail discoloration on the right third finger. (D) Unusual feature of several bluish plaques on the back. (E) Three asymptomatic bluish papules on the forearm.

detect the correlation of clinical and pathologic features.

MATERIALS AND METHODS

We reviewed the seventeen hospital charts and twenty-one biopsy slides of the seventeen patients with glomus tumor. Only the cases proven by histopathological evaluations were included among the patients who visited our department from January 1991 to February 1999, and one case from Ulsan University Hospital. Clinical evaluations were performed regarding the age, sex, age of onset, sites, associated symptoms and clinical manifestations. Histopathologically, we classified the subtypes according to proportion of glomus cells, blood vessels, and smooth muscle into solid glomus tumor (glomus tumor proper), glomangioma and glomangiomyoma.

RESULTS

Clinical Features

1. Among the 17 patients, 10 patients were male

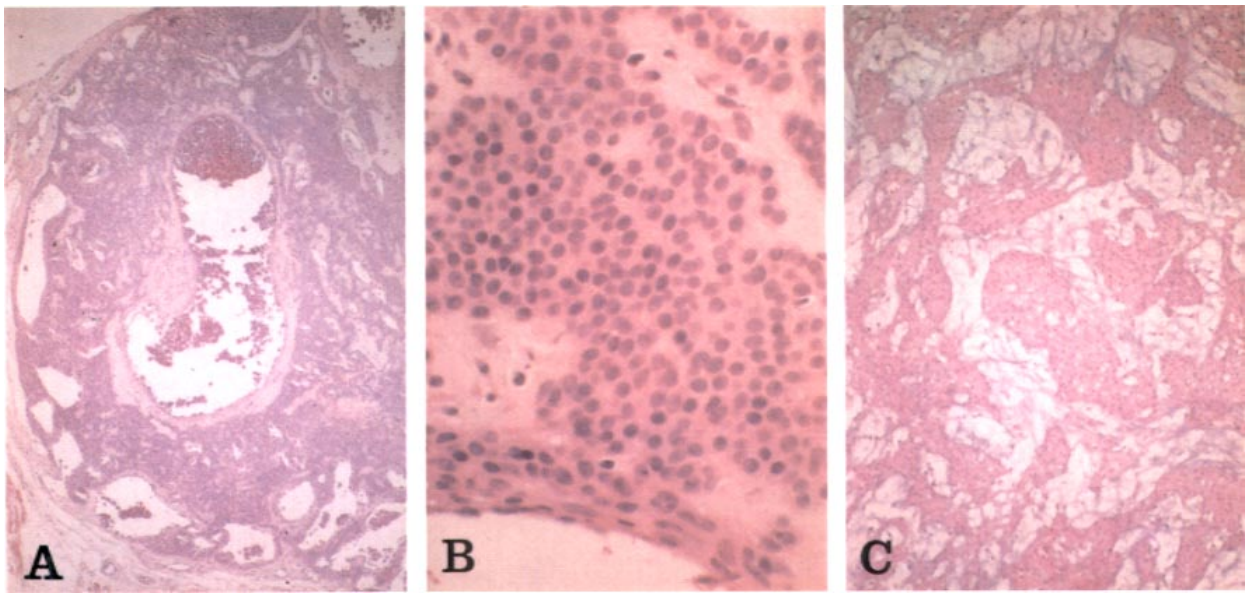

Fig. 2. Variable histopathologic pattern of glomus tumors. (A) Common form of glomus tumor showing well-circumscribed lesion and consisted of solid sheets of glomus cells interrupted by vessels of varying sizes (H&E, ×40). (B) Round regular shape cells with pale eosinophilic cytoplasm and central round nuclei (H&E, ×400). (C) Less frequent finding of myxoid change in stroma (H&E, ×100).

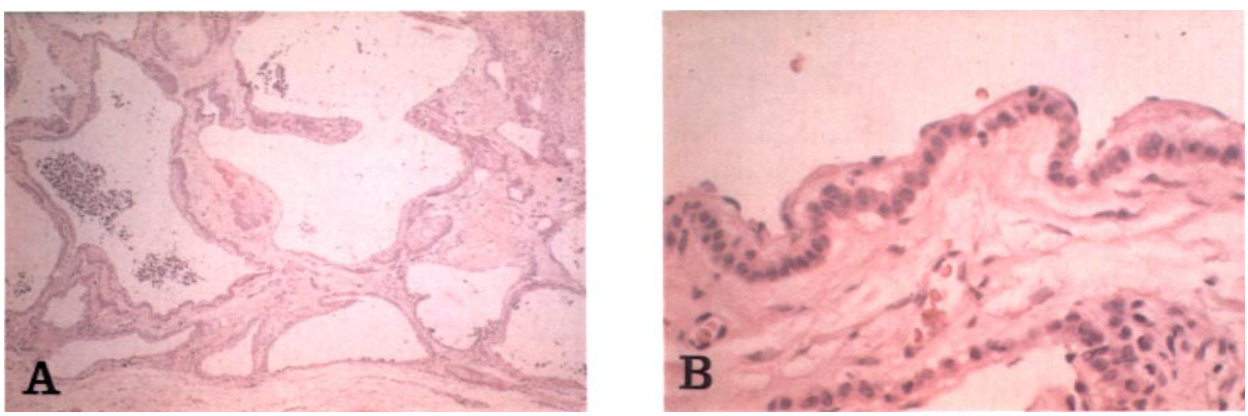

Fig. 3. Glomangioma. (A) Numerous dilated thin walled vascular spaces surrounded by one or a few layers of glomus cells (H&E, ×40). (B) Single layer of glomus cells surrounding vascular space (H&E, ×400).

and 7 patients were female (M:F=1:0.7).

2. The age of the onset of glomus tumor varied from birth to 61 years. The mean age of onset was 29 years, and the mean ages of the male and female groups were 32.6 years and 23.9 years, respectively.

3. The tumors were located at various sites of the body. The lesions were distributed as follows: finger, 6 cases (subungual, 4 cases; volar aspect of the distal phalanx, 1 case; periungual, 1 case), upper arm (4 cases), forearm (3 cases), back (2 cases), leg (1 case), foot (1 case). There was a difference between sex and the anatomical site of the tumor. In male patients only one of 10 tumors were found in the digits, while in female patients, 5 of the 7 tumors were located in the digits. While 7 of the 10 tumors were located on the arm in male patients, no female patients had the lesion on the arm.

4. Clinically, solitary bluish papule was the most common feature (Fig. 1A, B) and found in 6 patients of this study. In 5 patients, the lesion was a subcu-

Table 1. Summary of Cases of Glomus Tumors

Case	Sex/Age	Onset	Site	Symptom	Clinical manifestation	Pathologic type	Treatment
1	F/20y	18y	Lt. thumb, subungual	Pain & tenderness	Nail dystrophy	Solid with myxoid stroma	Excision
*2	F/17y	13y	Rt. lateral foot	Tenderness	Subcutaneous nodule	Solid	Excision
3	M/30y	29y	Lt. upperarm	Tenderness	Bluish papule	Solid	Excision
**4	M/26y	21y	Rt. forearm	No	Three papules	Glomangioma	Excision
5	F/56y	46y	Lt. leg	Tenderness	Subcutaneous nodule	Solid	Excision
6	M/25y	22y	Rt. 3rd subungual	Pain & tenderness	Nail pigmentation	Solid	Excision
7	M/51y	31y	Lt. forearm	No	Subcutaneous nodule	Glomangioma	No
8	F/25y	17y	Rt. 5th subungual	Intermittent pain	Nail pigmentation	Solid with myxoid stroma	Excision
9	F/27y	25y	Rt. 5th volar side	Pain & tenderness	Subcutaneous nodule	Solid	Excision
*10	M/52y	47y	Rt, shoulder	Pain & tenderness	Erythematous papule	Solid	Excision
11	M/61y	61y	Lt. upperarm	Pain & tenderness	Purple papule	Solid	Excision
12	F/23y	18y	Lt. 2nd subungual	Pain & tenderness	Nail discolorarion	Solid	Excision
*13	M/54y	51y	Back	Tenderness	Subcutaneous nodule	Solid	Excision
14	F/50y	30y	Lt. thumb periungual	Pain & tenderness	Bluish papule	Solid	Excision
15	M/65y	60y	Lt. upperarm	Pain & tenderness	No specific lesion	Solid	Excision
16	M/59y	44y	Rt. forearm	Intermittent pain	Purple papule	Glomangioma	Excision
**17	M/19y	At birth	Back	Mild tenderness	Several bluish plaques	Glomangioma	No

* Recurred lesion, ** Multiple lesions, y: years

taneous nodule and in 4 patients who had subungual lesion, one (case 1) had longitudinal nail dystrophy and 3 patients showed discoloration on the nail (Fig. 1C). One unusual feature of the tumor is multiple bluish plaques on the back (case 17, Fig. 1D). One patient (case 15) had no specific skin lesion but had a tender point on the shoulder.

5. Among the 17 patients, 15 patients had a solitary lesion (88.2%) and 2 male patients had multiple lesions (11.8%). One patient (case 4, Fig. 1E) had three discrete papules on the forearm and the other patient (case 17, Fig. 1D) had diffuse plaque type lesions on the back.

6. The most characteristic symptom of the glomus tumor was pain. In 12 of the patients (70.6%), pain was the major symptom, which was commonly described as excruciating and precipitated by pressure and tactile stimulation of even minor degree on the lesion in all cases, and two patients (case 8, 16) complained of intermittent mild pain with tenderness. One patient (case 17) complained of mild tenderness, and two patients (case 4, 7) noted no subjective symtom.

7. Fifteen patients were treated with simple excision, but 3 patients (20%) had a recurrence and were reoperated on. Two patients (case 7, 17) refused further treatment.

Histopathologic Features

A review of histological examination of the 21 biopsy slides of the 17 patients of the glomus tumors were performed. There was 13 glomus tumors classified as the solid type (76.5 %), and 4 as the glomangioma variety (23.5 %). All 4 patients who had glomangioma were male. There was no case of glomangiomyoma and glomangiosarcoma in this study.

The classic type glomus tumors were well-circumscribed and consisted of tight convolutes of capillary-sized vessels surrounded by collars of glomus cells (Fig. 2A). Most tumors were surrounded by a capsule-like rim of compressed fibrous tissue. The glomus cells had a round, regular shape with pale or eosinophilic cytoplasm, and round or ovoid punched-out central nuclei (Fig. 2B). In two cases, the stroma was edematous and showed extensive mixoid change (case 1 & 8, Fig. 2C). The alcian blue staining showed positive in the myxoid area. Very cellular glomus tumors resembled the adnexal tumor, hidradenoma.

In glomangioma, there were less well circumscribed and numerous dilated, cavernous-like, thin-walled vascular spaces surrounded by one or a few layers of glomus cells (Fig. 3).

Immunohistochemical staining of 5 cases (three classic glomus tumors and two glomangiomas) were performed. Vimentin and smooth muscle actin were identified in all 5 tumors, desmin was negative (less than 10%).

Clinical and pathologic findings were summarized in Table 1.

DISCUSSION

Glomus tumor was first described as a distinct clinical entity by Wood[4] in 1812, and in 1924 the histopathology was accurately described by Masson[5]. It was a distinctive neoplasm composed of the cells which resemble the modified smooth muscle cells of the normal glomus body. Glomus body is an arteriovenous shunt (Sucquet-Hoyer canal) concerned with thermoregulation and distributed throughout the body but are most numerous in the digits, palms and soles. Histologically they consist of an afferent arteriole, an anastomotic vessel, and a collecting venule[1,2].

Glomus tumors were uncommon tumors with an estimated incidence of 1.6% in the five hundred consecutive soft tissue tumors reported from the Mayo clinic[6]. It was equally common in both sexes (M:F=1:0.7, in our study), although there was a striking female predominance (3:1) among patients with subungual lesions1 like the results of this study. The majority of glomus tumors were diagnosed during adult life (20 to 40 years of age). In this study, the mean age of onset was 29 years. The lesions developed as small blue-red nodules that were usually located in the deep dermis or subcutis of the upper or lower extremity. The single most common site was the subungual region of the finger, but other common sites included the palm, wrist, forearm, and foot. It is now recognized that the tumor may also develop in sites where the normal glomus body might be sparse or even absent. In view of this, it is likely that some glomus tumors arise from differentiation of pleuripotential mesenchymal cells or ordinary smooth-muscle cells[1,2].

Most glomus tumors were solitary lesions, like our results (88.2%). The remaining 11.8% of the patients had multiple lesions with discrete papules or several plaques. In two previous large studies, incidence of multiple lesions was estimated to be just under 10% and it is similar to our result[7]. These reports indicated certain differences between the solitary and multiple forms. Multiple lesions occurred more often during childhood with a slight male predominance[7], were rarely subungual, and less likely to be painful or symptomatic[1,7]. Histologically, they were usually a poorly circumscribed tumor which resembled cavernous hemangioma. Actually, our two patients were male and the lesions started at birth and 21 years of age, respectively, and one patient noted no symptom and the other complained of just mild tenderness. A few patients with multiple glomus tumors had been known to have a family history and associated anomaly[8], although none of our patients had. By Landthaler et al[3], multiple glomus tumors were classified as regional type (nonfamilial), disseminated type (familial), congenital plaque-like type (nonfamilial). According to this classification, it was possible that our patient (case 4) had regional type and the other patient (case 17) had congenital plaque-like type.

The symptoms produced by glomus tumors were quite characteristic and often well out of proportion to the size of the neoplasm. The paroxism of pain was the most common

complaint, and was elicited by changes in tem-

perature (especially cold) or pressure. Although the mechanism of the pain production had not been fully elucidated, nerve fibers containing immunoreactive substance P within the glomus tumors was identified recently[9].

The glomus tumors showed a varying proportion of glomus cells, vascular structures, and smooth muscle tissues. According to the relative proportions, they have been divided into three groups: glomus tumor proper, glomangioma, glomangiomyoma[1,2]. Unlike classic glomus tumor, glomangioma is usually the type encountered in patients with multiple or familial lesions. By Einzinger and Weiss1, the proportion of each subtype was glomus tumor proper 73%, glomangioma 19%, and glomangiomyoma 8%. According to this classification, 76.5% of our patients were classic glomus tumor, 23.5% were glomangioma. In glomangiomyoma, there was an important number of spindle-shaped smooth-muscle cells. Other rare variants of glomus tumor were infiltrating type, associated with high recurrence rate, and glomangiosarcoma[2]. Another histologic classification was based on the amount of vascularity and stroma: vascular, cellular with myxoid stroma, cellular without myxoid stroma[10].

Immunohistochemically, glomus tumors stained positively for muscle-specific actin and vimentin, negatively for high and low molecular weight cytokeratins, myoglobin, S-100 protein, neurofilaments, CEA, and EMA[11]. Desmin is much more variable, and the expression of desmin has been reported in no tumors[11,12], or the majority of tumors[13].

Histopathologic differential diagnosis of glomus tumor was hidradenoma, intradermal nevus, eccrine spiradenoma, and in cases of glomangioma, carvernous hemangioma was included in the differential diagnosis[2]. Special and immunohistochemical staining may help the differencial diagnosis.

Although the question of malignant tansformation of glomus tumor had been reported[14], this appeared to be such a rare event. Essentially all glomus tumors were benign and were adequately treated by simple excision, but ablation with CO_2 laser and radiotherapy were also reported[15,16]. About 10% of the tumors recurred after the excisions were reported[17]. In our study, 15 of the 17 patients wanted removal of the lesions, 20% of the lesions recurred following simple excision.

In conclusion, glomus tumors were most commonly seen as a painful nodule on the upper extremity and especially female patients showed a predilection for the subungual location. We speculate that multiple, mild symptomatic lesions might be a tendency to be glomangioma.

REFERENCES

1. Einzinger FM, Weiss SW. Soft tissue tumor. 3rd ed. St. Louis: Mosby-Year Book, 701-713, 1995.
2. Calonje E, Wilson-Jones E. Vascular tumors. In: Elder D, Elenitas R, Jaworsky C, et al, eds. Histopathology of the skin. 8th ed. Philadelphia: Lippincott-Raven, 925-927, 1997.
3. Landthaler M, Braun-Falco O, Eckert F, Stolz W, Dorn W, Woff HH. Congenital multiple plaquelike glomus tumors. Arch Dermatol 126:1203-1207, 1990.
4. Wood W. On painful subcutaneous tubercle. Edinb Med J 8:283-291, 1812.
5. Masson P. Le glomus neuro-arterial des regions tactiles et ses tumeurs. Lyon Chir 21:256-280, 1924. cited from Heys SD, Brittenden J, Atkinson P, Eremin O. Glomus tumor:an analysis of 43 patients and review of the literature. Br J Siug 79:345-347, 1992.
6. Shugart RR, Soule EH, Johnson EW. Glomus tumor. Surg Gynecol Obstet 117:334-340, 1963.
7. Conant MA, Wiesenfeld SL. Multiple glomus tumors of the skin. Arch Dermatol 103:481-485, 1971.
8. Tran LP, Velanovich V, Kaufmann CR. Familial multiple glomus tumor: report of pedegree and literature review. Ann Plastic Surg 32:89-92, 1994.
9. Kishimoto S, Napatani H, Miyashita A, Kobayashi K. Immunohistochemical demonstration of substance P-containing nerve fibers in glomus tumor. Br J Dermatol 113-213, 1985.
10. Liapi-Avgeri G, Karabela-Bouropoulou V, Agnanti N. Glomus tumor: a histological, histochemical and immunohistochemical study of the various types. Pathol Res Pract 190:2-10, 1994.
11. Dervan PA, Tobboa IN, Casey M, O'Loughlin J, O'Brien M. Glomus tumors: an immunohistochemical profile of 11 cases. Histopatholpathology 14:483-491, 1989.
12. Schurch W, Skalli O, Lagace R, Seemayer TA, Gabbiani G. Intermidiate filament proteins and actin isoforms as markers for soft tissue tumor differ-

entiation and origin. III. Hemangiopericytomas and glomus tumors. Am J Pathol 136:771, 1990.
13. Porter PL, Bigler SA, Mcnutt M, Gown AM. The immunophenotype of hemangiopericytoma and glomus tumors with special reference to muscle protein expression: an immunohistochemical study and review of literature. Mod Pathol 4:41, 1991.
14. Lopez-Rios F, Rodriquez-Peralto JL, Castano E, Ballestin C. Glomangiosarcoma of the lower limb: a case report with a literature review. J Cut Pathol 24:571-574, 1997.
15. Goldman L. Laser treatment of multiple glomangiomas. Arch Dermatol 117:451-452, 1981.
16. Singhal S, Sharma S, Dixit S, De S, Chander S, Rath GK. Primary radiation therapy in the management of glomus tumors. Ind J Cancer 30:120-124, 1993.
17. Goodman TF, Abele DC. Multiple glomus tumors. Arch Dermatol 103:11-23, 1971.