

Pyogenic Granuloma Following Laser Treatment of a Port-Wine Stain

Betsy B. Beers, MD, Minneapolis, Minnesota
O.J. Rustad, MD, Minneapolis, Minnesota
J. Corwin Vance, MD, Minneapolis, Minnesota

A pyogenic granuloma occurred in a port-wine stain treated with first an argon, and subsequently a carbon dioxide, laser. Although reports of this phenomenon are infrequent in the literature, our review suggests that this is not a rare complication. The pathogenetic implications are discussed.

Laser surgery has become the treatment of choice for port-wine hemangiomas. Good to excellent cosmetic results may be achieved with both the argon¹⁻⁵ and carbon dioxide⁶ lasers. Active investigation continues in the use of other lasers, including pulsed and tunable dye lasers⁷⁻⁹ and the neodymium-YAG laser.^{10,11}

The most frequent complication of laser therapy of port-wine stains is hypertrophic scarring,^{6,12,13} which occurs with a variable incidence estimated at around 10 percent in lesions treated with the argon laser.¹⁴ Less frequent complications include pigmentary changes, atrophic scarring, infection, hemorrhage, pain, and prolonged healing time.¹⁵ Benign reactive proliferations, predominantly in the form of angiomas and pyogenic granulomas, have also been seen. Olbricht et al¹⁵ recently surveyed 139 selected dermatologists and plastic surgeons regarding complications of cutaneous laser surgery and found that benign reactive proliferations were observed by 10 percent of argon laser users and 7 percent of carbon dioxide laser users. In their survey, five physicians reported angiomas and pyogenic granulomas in six patients whose port-wine stains were treated with the argon laser. Additionally, three cases of excess granulation tissue and four cases of pyogenic granuloma were reported after carbon dioxide laser treatment (lesions unspecified). On the basis of this survey, the rate of benign reactive proliferations was estimated at 0.07 percent for the argon laser and 0.2 percent for the carbon dioxide laser.

We have found additional reports in the literature of pyogenic granuloma as a complication of laser surgery. Dejonkere et al¹⁶ describe "an exuberant granulation tissue with telangiectasias and a fibrous stroma" occurring approximately three months after endolaryngeal argon laser resection of a cicatricial web of the vocal cords. Dixon and Gilbertson¹¹ noted three cases of pyogenic granuloma in a series of thirty-seven patients treated with the argon and neodymium-YAG lasers for nodular port-wine stains. The latter cases apparently occurred after deep infection of the remaining capillary bed.

We report here an occurrence of pyogenic granuloma in a patient treated serially with an argon, and subsequently a carbon dioxide, laser for a congenital port-wine stain. Pyogenic granuloma formation is an unusual, though perhaps not rare complication of cutaneous laser surgery.

Case Report

A 35-year-old white woman presented with a history of a congenital port-wine stain on the left side of her face. There were no associated abnormalities and her past medical history was otherwise unremarkable. She was not pregnant and was taking no medications. Examination revealed a uniform purple to red patch in the distribution of the first and second branches of the left trigeminal nerve.

Using an argon laser (H.G.M., Inc.), a test patch measuring 1 by 1 cm was treated, which showed 50 percent fading after four months. Subsequently, she underwent five treatments with an average interval of three months between treatments. The laser variables used were: 1 mm spot size, 0.2 second pulse duration and 0.5 second pulse interval, 0.82 to 1.0 watts, and 400 to 2300 impacts per treatment. Overall there was a 60 to 70 percent lightening of the hemangioma after completion of these treatments. However, there were residual dark areas on the upper lip and suborbital regions, and further improvement was considered possible with use of a carbon dioxide laser.

A 1 by 1 cm test patch at the left nasolabial fold was treated with the CO₂ laser (Minnesota Laser Corporation Portalase). The power output was 5 watts with superpulsing at 5000 pulses per second in a continuous mode defocused at a distance of 10 cm. Local anesthesia was accomplished with 2 percent lidocaine with epinephrine 1:100,000. Vigilon dressings were changed daily. The hemangioma demonstrated fur-

From the Department of Dermatology, University of Minnesota, Minneapolis, Minnesota.

REPRINT REQUESTS to University of Minnesota, Department of Dermatology, Box 98 Mayo, 420 Delaware Street, S.E., Minneapolis, Minnesota 55455 (Dr. Vance).



FIGURE 1. Pyogenic granuloma on left cheek three months after carbon dioxide laser treatment of port-wine stain.

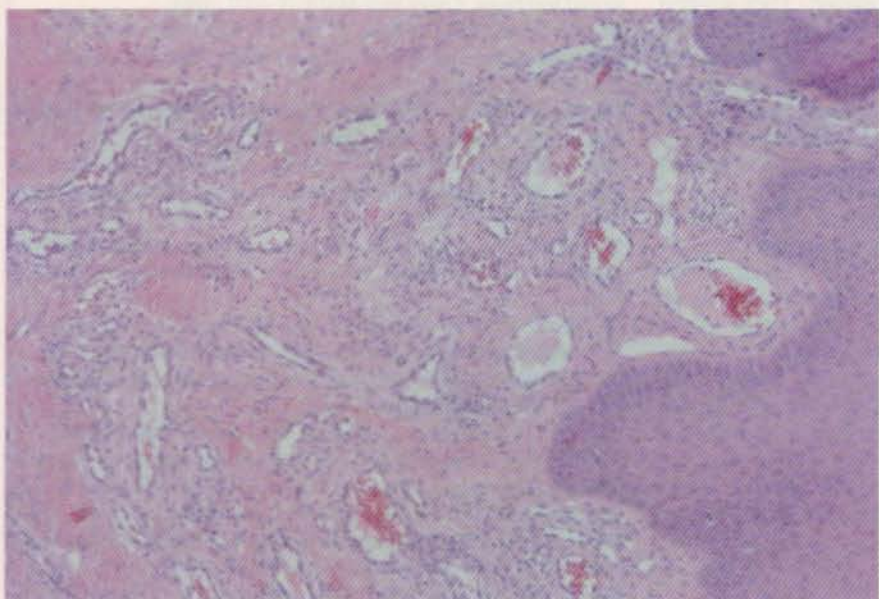


FIGURE 2. Histologic examination of lesion shown in Figure 1 shows characteristic lobular proliferation of capillaries in loose stroma.

ther fading after three months. A 7 by 7 cm area over the left cheek and lower eyelid, extending to the nasolabial fold but sparing the nose and upper lip, was then treated using the same laser settings. Vigilon dressings were again used.

She returned three months later with a nodule on the left cheek that had occurred over two months, but had shown some initial involution (Figure 1). It was a 5 by 5 mm red friable nodule with a superficial draining ulcer. The lesion was excised elliptically, and further treatment deferred since there

was little change in the hemangioma since the last visit. The biopsy specimen showed a lobular capillary proliferation that was interpreted as a pyogenic granuloma (Figure 2).

Comments

The occurrence of a pyogenic granuloma in our patient following argon and carbon dioxide laser treatment of a port-wine stain was an unexpected complication. Although there are few

reports of this phenomenon in the literature,^{11,15} it would appear that benign reactive vascular proliferations such as pyogenic granuloma are not rare complications of cutaneous laser surgery. In addition to the survey data obtained by Olbricht et al¹⁵ and the three cases mentioned by Dixon and Gilbertson,¹¹ Leon Goldman (personal communication, 1987) has observed the formation of pyogenic granuloma in port-wine marks following laser therapy. Pyogenic granuloma have also been noted to occur de novo in port-wine stains.^{17,18}

The cause of pyogenic granuloma remains unknown. While many authors believe that this lesion represents an exuberant granulation tissue response,^{19,20} others view it as a distinct neoplastic process because of the characteristic lobular arrangement of capillaries.²¹ Trauma has been implicated²² and there are many reports of the occurrence of pyogenic granuloma following a variety of traumatic manipulations. These include nose boring for the wearing of ornaments in India,²³ smallpox vaccination,²⁴ and hair transplantation.²⁵ However, trauma alone is not sufficient to account for all cases of pyogenic granuloma. Some authors contend that an infectious agent, perhaps introduced by minor trauma, is responsible for formation of this lesion.^{20,24} Hormonal factors seem to play a role, since pyogenic granuloma occur commonly in pregnant women and those taking oral contraceptives.²⁶

Rusin and Harrel²⁷ suggested that pyogenic granuloma may represent a form of arteriovenous fistula with subsequent development of secondary collateral circulation. They suggest that highly vascularized areas such as the fingers, hands, lips, and tongue may be favored sites for pyogenic granuloma due to increased numbers of microscopic arteriovenous anastomoses in these locations. Swerlick and Cooper¹⁷ suggest that the spontaneous development of pyogenic granuloma in port-wine stains may similarly be associated with microscopic arteriovenous anastomoses in these locations.

Our observation of the development of a pyogenic granuloma in a port-wine stain following argon and then carbon dioxide laser therapy is interesting for a number of reasons. First, it would appear that the port-wine stain may already be predisposed to the spontaneous occurrence of this lesion, perhaps because of the increased numbers of microscopic arteriovenous anastomoses. Second, the trauma of laser therapy might easily accelerate such a tendency. Finally, we believe that the formation of pyogenic granuloma following laser treatment of the port-wine stain may not be rare, but may occur more frequently than the literature would suggest. Laser surgeons who treat port-wine stains should be aware of this potential complication.

REFERENCES

- Goldman L, Dreffer R, Rockwell RJ, et al: Treatment of port-wine marks by an argon laser. *J Dermatol Surg* 2: 385-388, 1976.
- Cosman B: Experience in the argon laser therapy of port-wine stains. *Plast Reconstr Surg* 65: 119-129, 1980.
- Noe JM, Barsky SH, Greer DE, et al: Port-wine stains and the response to argon laser therapy: successful treatment and the predictive role of color, age, and biopsy. *Plast Reconstr Surg* 65: 130-136, 1980.
- Landthaler M, Haina D, Waidelich W, et al: A three-year experience with the argon laser in dermatotherapy. *J Dermatol Surg Oncol* 10: 451-461, 1984.
- Silver L: Argon laser photocoagulation of port-wine stain hemangiomas. *Lasers Surg Med* 6: 24-28, 1986.
- Ratz JL, Bailin PL, Levine HL: CO₂ laser treatment of port-wine stains: a preliminary report. *J Dermatol Surg Oncol* 8: 1039-1044, 1982.
- Tan OT, Tang S, Garden J, et al: Pilot study: treatment of port-wine stains using a 577 nm pulsed dye laser. *Lasers Surg Med* 5: 178-179, 1985.
- Hulsbergen-Henning JP, van Gemert MJC, Lahaye CTW: Clinical and histological evaluation of port-wine stain treatment with a microsecond-pulsed dye laser at 577 nm. *Lasers Surg Med* 4: 375-380, 1984.
- Morelli JG, Tan OT, Garden J, et al: Tunable dye laser (577) treatment of dark nodular port-wine stains. *Lasers Surg Med* 5: 178, 1986.
- Landthaler M, Brunner L, Haina D, et al: First experiences with the Neodymium-YAG laser in dermatology. In: *Neodymium-YAG Laser in Medicine and Surgery* (Jaffe SN, ed), p 175. New York, Elsevier Science Publishing, 1983.
- Dixon JA, Gilbertson JJ: Argon and Neodymium YAG laser therapy of dark nodular port-wine stains in older patients. *Laser Surg Med* 6: 5-11, 1986.
- Dixon JA, Huether S, Rotering R: Hypertrophic scarring in argon laser treatment of port-wine stains. *Plast Reconstr Surg* 73: 771-772, 1984.
- Apfelberg DB, Flores JT, Maser MR, et al: Analysis of complications of argon laser treatment for port-wine hemangiomas with reference to the striped technique. *Lasers Surg Med* 2: 357-371, 1983.
- van Gemert MJC, Welch AJ, Tan OT, et al: Limitations of carbon dioxide lasers for treatment of port-wine stains. *Arch Dermatol* 123: 71-73, 1987.
- Olbricht SM, Stern RS, Tang SV, et al: Complications of cutaneous laser surgery: a survey. *Arch Dermatol* 123: 345-349, 1987.
- Dejonkere PH, Franceschi D, Scholtes JL: Extensive granuloma pyogenicum as a complication of endolaryngeal argon laser surgery. *Lasers Surg Med* 5: 41-45, 1985.
- Swerlick RA, Cooper PH: Pyogenic granuloma (lobular capillary hemangioma) within port-wine stains. *J Am Acad Dermatol* 8: 627-630, 1983.
- Warner J, Wilson-Jones E: Pyogenic granuloma recurring with multiple satellites: a report of 11 cases. *Br J Dermatol* 80: 218-227, 1968.
- Ackerman AB: *Histologic Diagnosis of Inflammatory Skin Diseases*, p 724-727. Philadelphia, Lea & Febiger, 1978.
- Kerr DA: Granuloma pyogenicum. *Oral Surg* 4: 158-176, 1951.
- Mills SE, Cooper PH, Fechner RE: Lobular capillary hemangioma: the underlying lesion of pyogenic granuloma; a study of 73 cases from the oral and nasal mucous membranes. *Am J Surg Pathol* 4: 471-479, 1980.
- Michaelson HE: Granuloma pyogenicum. A clinical and histological review of 29 cases. *Arch Dermatol* 12: 119-128, 1925.
- Premalatha S, Thambiah AS: Pyogenic granuloma following the trauma of nose-boring. *Br J Dermatol* 100: 455-458, 1979.
- Zayid I, Farraj S: Granuloma pyogenicum—a hitherto unrecognized complication of smallpox vaccination. *Br J Dermatol* 90: 293-299, 1974.
- Sarnoff DS, Goldberg DJ, Greenspan AH, et al: Multiple pyogenic granuloma-like lesions following hair transplantation. *J Dermatol Surg Oncol* 11: 32-34, 1985.
- Mussalli NG, Hopps RM, Johnson NM: Oral pyogenic granuloma as a complication of pregnancy and the use of hormonal contraceptives. *Int J Gynaecol Obstet* 14: 187-191, 1976.
- Rusin LJ, Harrell ER: Arteriovenous fistula: cutaneous manifestations. *Arch Dermatol* 112: 1135-1138, 1976.