Clinical Experience Using CO₂ Laser Scalpel to the Cancer of the Breast

Yoichi Murayama, Kazuhiko Aoyagi, Keiichi Okamura,
Masuo Iizuka and Nobuyoshi Kimura

From the Second Department of Surgery
Tokyo Medical and Dental University

Introduction

The carbon dioxide (CO₂) laser, developed by C.K.N. Patel in 1965, is expected to evolve as a prominent therapy for the treatment of cancer of the breast. This expectation for this use is based upon the merits of the CO₂ laser scalpel, which has the following characteristics: (1) Photons are emitted with enormous power density at a single point because their wavelength and phase are coherent; (2) all tissues are vaporized instantaneously with no necessary follow-up treatment because the laser's wavelength is 10.6 μ , being 100% absorbed into water; (3) as the laser is highly convergent, a remote single point is able to be targeted; (4) bloodless surgery is possible; (5) there is no danger of remote metastases of cancer cells associated with the conventional surgical procedures since both the blood and lymphatic vessels are sealed; (6) safety of the laser apparatus is easily secured; (7) it can be used under local anesthesia; (8) operational procedures can be performed within a short duration of time;

With consideration of the abovementioned characteristics and advantages, the CO₂ laser has been used by the authors in the treatment of cancer of the breast (i.e. topical therapy for skin flap preparation, separation of subcutaneous tissues, topical recurrence, and for metastases to the skin and lymph nodes). Laser treatment of metastatic lesions to the skin from mastocarcinomas and the histologic results of laser therapy will be presented at this medical meeting.

Methods and Results

The differences in the course of the healing process between surgical resection and laser irradiation with 40 W of multiple and nodular skin metastatic lesions were distinctive. In cases treated by means of surgical resection with a scalpel, the wounds healed within one week, whereas the wounds created by the laser scalpel required approximately one month to heal. This difference is probably due to secondary wound healing. The operational procedures involving surgical resection with a scalpel required 10 minutes, and

were accompanied by significant hemorrhaging, whereas there was no hemorrhaging with the use of the laser scalpel, and tumors were vaporized and evadicated within 30 seconds. As part of our surgical test protocol, the upper 1/2 of one tumor was subjected to laser vaporization, and the remaining tumor remnant was surgically extirpated in order to examine the condition of the laser irradiated stump. The histopathology of the remaining tumor was then studied. As the result of the examination, the necrotic layer of the stump was found to be thin, with a depth of 50 μ , with degeneration of the lower layers evident. However, cancer cells were identified over a considerably broad area.

On the basis of the abovementioned results, it has been determined that vaporization should be conducted over a sufficiently wide and deep area including the surrounding normal tissues by a width of 1 cm. This recommended protocol should ensure the complete evadication of cancerous cells.

The results of laser irradiation of metastatic lesions to the skin were also examined. These lesions were of the dispersing or partially infiltrating type that appeared in the topically irradiated field site following mastectomy. In our cases, minute nodules less than 5 mm in size that were scattered in the circumference of the irradiated site one to three months following laser irradiation to lesions of the dispersing type suddenly enlarged. In addition, a further complication evolved as sufficiently deep irradiation was unable to be performed against lesions of the infiltrating type on the supraclavicular fossa. When compared with completely vaporized lesions, the cure of such sites was extremely poor, and the sites became ulcerated later on.

Conclusion

Based upon the abovementioned results, the indications for CO₂ laser scalpel procedures in the treatment of topical recurrence of carcinoma of the breast and metastases to the skin and lymph nodes will be limited to tumors of the nodular type and some of the dispersing type. In addition, for tumors of the circumscribed nodular type, it will be better to resect the lesions with a laser scalpel together with surrounding normal tissue en masse rather than to attempt to vaporize the lesions themselves, thereby reducing the possibility of leaving remaining cancerous cells present at the surgical site.