

# An Immediate Reconstructive Surgery with a Pectoralis Major Myocutaneous Flap using the LigaSureImpact™ Vessel-sealing Device- A Technical Case Report

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## Abstract

Clinical usefulness of using LigaSure™ vessel-sealing devices and the Valleylab™ electrode knife (Covidien, USA) for head and neck cancer surgery was reported. These instruments were applied to the hemiglossectomy with bilateral neck dissection and immediate reconstruction with a pectoralis major myocutaneous flap for a 64-year-old woman with squamous cell carcinoma of the right tongue (stage T4aN2bM0). In this case, LigaSureImpact™ vessel-sealing device was remarkably useful for a short time harvesting PMMC flap with a small amount of intraoperative blood loss. LigaSureImpact™ vessel-sealing bipolars is useful device in the field of reconstructive surgery in the case of harvesting bulky flap.

**Keywords:** LigaSureImpact™ vessel-sealing bipolars; Myocutaneous flap; Reconstructive surgery; Head and neck cancer

## Introduction

LigaSure™ vessel-sealing system (LigaSure™ VSS) (Covidien, USA) is a bipolar electro-surgical device that provides hemostasis by denaturing collagen and elastin from the vessel wall and surrounding connective tissue. The system evaluates the impedance of the tissue 3,333 times a second and delivers the appropriate amount of energy needed to seal the tissue [1-7]. There are two useful vessel-sealing devices for head and neck surgery and reconstructive surgery, one is the LigaSure Small jaw™ (Small jaw™) [1-4] and the other is the LigaSureImpact™ (Impact™) [5-7]. Small jaw™ is utilized for sealing and cutting up to 14.7 mm thickness of the connective tissue or muscle, and Impact™ is utilized for sealing and cutting up to 34.0 mm thickness. However, the limitation of vessel sealing by Small jaw™ and Impact™ is determined up to 7 mm in diameter by the US Food and Drug Administration (Figure 1). In the field of head and neck surgery, Small jaw™ has been shown to be safe and effective for thyroid surgery and parotid gland surgery [1-4] without needing to seal bulky tissue. On the other hand, Impact™ is an especially useful device for bulky tissue to reduce blood loss and operating time in general surgery, such as hepatectomy, splenectomy, and pancreatoduodenectomy [5-7]. Furthermore, the Valleylab™ electrode knife (Valleylab™) with Valleylab™ mode (V mode) is a newly developed device and can provide a monopolar wave form for controlled dissection. Three output modes are selected at the handset with the following buttons: The yellow button enables a cutting function. The clear Valleylab button enables a hemostasis function while providing dissection. The blue button enables a coagulation function. A dual slider control switch adjusts power output (Figure 2) [8].

In this report our clinical experience of an immediate reconstructive surgery with a PMMC flap by using Impact™ and Valleylab™ with V mode.

## Technical Case Report

A 64-year-old woman was referred to our clinic with chief complaint of a painful mass in the right side of the tongue in January 2015. She had felt pain on swallowing foods for 1 month. Clinical examinations, including CE-CT scan, CE-MRI, Ultrasonography, PET-CT scan and biopsy, demonstrated squamous cell carcinoma of the right tongue with expansion to the mouth floor (stage, T4aN2bM0). Also, she was diagnosed as a hypertension with moderate arteriosclerosis with high plaque score of carotid artery.



**Figure 1:** The upper device: Impact™: tissue sealing and cutting length=34.0 mm.

The lower device: Small jaw™: tissue sealing and cutting length=14.7 mm. For length of vessel sealing, use of Small jaw™ and Impact™ is limited to seal vessel up to 7 mm in diameter by the US Food and Drug Administration.



**Figure 2:** Three output modes are selected at the handset with the following buttons:

- The yellow button enables a cutting function.
- The clear Valleylab button enables a hemostasis function while providing dissection.
- The blue button enables a coagulation function.

A dual slider control switch adjusts power output.

Early in February, hemiglossectomy with right-side total neck dissection and left-side supraomohyoid neck dissection was performed. The tissue defect due to tumor ablation was immediately reconstructed by using a pectoralis major myocutaneous (PMMC) flap due to reduce operating time for prevention of a thrombosis.

At the beginning of surgery, tracheotomy was performed to prevent postoperative asphyxia, and the skin incision was made by using Valleylab™ selected V mode combined cutting and coagulation without a scalpel (Figure 2). Small jaw™ was used for sealing and cutting small vessels and tissue. The first step to use Small jaw™ is to place the tissue between the jaws. The adequate radiofrequency energy to seal the tissue is delivered by grasping the handle in 2-4 seconds. After sealing, pulling up the cutting lever completes cutting the sealed tissue. However, to make surely sealing of external jugular vein and facial artery and vein, conventional ligation with silk thread was applied.

Hemiglossectomy was performed by using Valleylab™ selected V mode. Deep lingual artery and vein were ligated by silk threads. Operating time of hemi-glossectomy and neck dissection with pull-through method was 148 minutes, and blood loss was significantly reduced to 106 g.

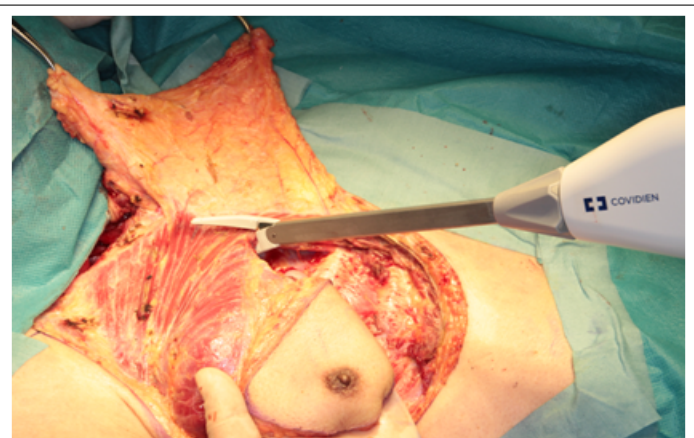
Then, a short time reconstructive surgery with a PMMC flap was started. The flap design was a semicircle of 11 × 7 cm including the nipple at the level of the 6th rib. The flap elevation was started by using Valleylab™ with V mode for skin incision without a scalpel from the right clavicle part to proximal direction without blood loss (Figure 3). When harvesting a PMMC flap, Impact™ was used for short time sealing and cutting of its bulky muscle.

How to use of Impact™ is almost same as Small jaw™. The first step is to place the tissue between the jaws. The second step is to click the purple activation button until sealing the tissue completely. Finally, pulling up the cutting lever completes cutting the sealed tissue (Figure 4). The time required harvesting a PMMC flap was only 15 minutes caused by Impact™ big jaws, and blood loss was extremely small amount of 4 g. The flap was inserted to suture with residual oral tissue. Finally, total operating time was 332 minutes, and intraoperative blood loss was 110 g.

Postoperativelocal and systemic complications were not observed. Four days after surgery, all drainage tubes were removed.



**Figure 3:** Bloodless incision by a superfine needle blade selected the middle V button, V mode of Valleylab™



**Figure 4:** Bloodless harvesting a PMMC flap with sealing and cutting muscle using Impact™

## Discussion

LigaSure™ VSS consists of a bipolar radiofrequency generator and forceps which has been used to achieve hemostasis in various types of surgery. The system applies a precise pressure and energy for transformation of the collagen and elastin within vessel walls and creating or making a permanent sealing [1-7]. In thyroid surgery, Small jaw™ significantly reduces the operating time without increasing intra-operative blood loss, morbidity and/or duration of hospitalization [1-4]. Although the intraoperative total blood loss in the thyroidectomy using Small jaw™ was significantly lowers than that in it without Small jaw™, postoperative blood loss was not different [4].

In hepatectomy, splenectomy and pancreatoduodenectomy, Impact™ is also used to reduce blood loss and operating time [5-7]. The damage in cell or tissue on the dissection margins of pancreatoduodenectomy using Impact™ was not observed in the microscopic observation [8].

Furthermore, Valleylab™ with V mode indicated less lateral thermal spread compared with conventional electro-surgical generator (Force FXTM, Boulder, CO). This was demonstrated by histological findings in the animal study using porcine skin, small bowel, and small bowel mesentery [9]. In head and neck cancer surgery, Valleylab™ with V mode was used as a monopolar waveform to control dissection with hemostasis and reduction of the tissue damage [10].

In this clinical experience, we use Valleylab™ with V mode, Small jaw™, and Impact™ for hemiglossectomy with neck dissection and an immediate reconstruction with a PMMC flap.

Valleylab™ with V mode monopolar could control cutting and coagulation which induced to easy skin incision and tissue dissection with less bleeding and tissue drag. Also, Small jaw™ bipolar was useful sealing vessel up to 7 mm in diameter and sealing and cutting up to 14.7 mm thickness of the connective tissue or muscle in the neck dissection and hemiglossectomy with less blood loss. On the other hand, Impact™ bipolar which has approximately 2.3 times sealing length for connective tissue and muscle comparing to that of the Small jaw™, however, there were no clinical reports for reconstruction with myocutaneous flap using Impact™. In this technical case report, Impact™ was indicated one of the suitable devices for harvesting the bulky flap in short time.

In conclusion, the present surgical devices, LigaSureImpact™ bipolar and Valleylab™ with V mode monopolar, are remarkably useful devices with an addition of the well-known LigaSure Small jaw™ in the field of head and neck surgery.

### Funding

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### Competing Interests

None.

### Ethical Approval

Not required.

### Patient Consent

Not required.

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