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LETTER TO EDITOR

Feasibility of a new microwave energy-based scissors device for hepatectomy

KEYWORDS
Hepatectomy;
Scissors-type device;
Hemostasis;
Right lobe mobilization

To the editor,

Recently, we have developed a new microwave energy-based surgical device for coagulation and cutting called "Acrosurg.®" (Nikkiso Co., Ltd, Tokyo, Japan), which has been covered by the Japanese Health Insurance for clinical use since January 2017. "Acrosurg." is a surgical energy device incorporating microwave technology with coagulation, dissection, and vessel sealing capabilities.[1] The bursting pressures of artery, vein, and lymphatic vessels are similar to that with other sealing energy devices.[2] However, the time taken to seal and cut large vessels is shorter than that of the ultrasonic scalpel.[3] We have surgical experience in performing hepatectomy where adhesiotomy, liver mobilization, and transection of the liver surface have been performed by using the scissors-type "Acrosurg." Here, we present instances of actual "Acrosurg." use in our institute, and also the short-term outcomes observed.

Between April 2016 and October 2017, 21 patients required complete mobilization of the right lobe, which included right lobectomy, right tri-segmentectomy, posterior segmentectomy, and sub-segmentectomy of S7. Between April 2016 and December 2016, 11 patients underwent right lobe mobilization with the use of conventional surgical devices of electric cautery (Conventional group). "Acrosurg." was used in 10 patients (Acrosurg. group) from January 2017 to October 2017. Patients' background, perioperative factors, and duration of complete right lobe mobilization were retrospectively reviewed from the clinical records. The duration of complete right lobe mobilization was defined as the time interval between cutting the round ligament and complete detachment from the inferior vena cava. When short hepatic veins had to be dissected, ligation or coagulation was combined accordingly. We could safely perform hepatic veins dissection with the use of "Acrosurg." as shown in Fig. 1. This study was approved by the Ethics Committee of Shiga University of Medical Science (approval no. 29-191), and the necessary informed consent was obtained from all the patients included in the study.

Table 1 presents the comparison of clinical parameters between the conventional group and the Acrosurg. group. The number of hepatitis C infections was significantly larger in the conventional group ($p = 0.035$). The hepatic functional reserve measures including albumin, bilirubin, platelet count, prothrombin activity, and indocyanine green retention rate at 15 min were similar between the groups. The duration of right lobe mobilization in the Acrosurg. group was significantly lesser than that in the conventional group (median 81 min vs. 110 min, $p = 0.04$). There was no significant difference between the two groups in postoperative complications.

The present review reports the first clinical use of "Acrosurg." for hepatectomy worldwide, which is evolved from microwave technology as a novel surgical device in our institute. "Acrosurg." was used only for the transection of the liver surface, and therefore, its usefulness in transection of the liver parenchyma has not been discussed here.

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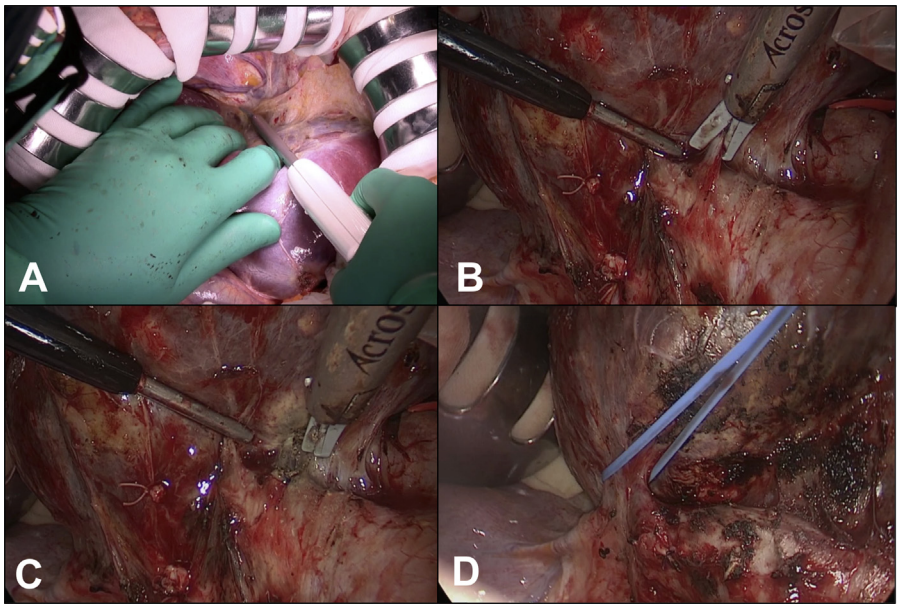

Figure 1 Use of "Acrosurg." A) Dissection of falciform ligament, coronary ligament and triangular ligament; "Acrosurg." effectively coagulates tissue and achieves hemostasis by microwave technology. B)&C) Detachment of right lobe from inferior vena cava; Even a relatively large short hepatic vein can be dissected by "Acrosurg." alone. D) Complete right lobe mobilization; No postoperative hemorrhagic adverse event was observed in this case.

Table 1 Comparison between Acrosurg. Group and conventional group in patients' clinicopathological background, operative factors and short-term outcomes.

		Acrosurg. group (n = 10)	Conventional group (n = 11)	p.value
Age (year)		69.8 ± 9.1	67.5 ± 10.6	0.595
Body mass index (Kg/m^2)		22.0 ± 4.2	21.6 ± 3.3	0.807
Etiology (%)	HBV	1 (10.0)	0 (0.0)	0.035
	HCV	0 (0.0)	5 (45.5)	
	NBNC	9 (90.0)	6 (54.5)	
Gender (%)	Female	5 (50.0)	5 (45.5)	>0.999
	Male	5 (50.0)	6 (54.5)	
Diabetes mellitus (%)		3 (30.0)	4 (36.4)	>0.999
Albumin (g/dl)		3.90 [3.80, 4.10]	3.70 [3.15, 3.95]	0.165
Alanine aminotransferase (IU/L)		19.5 [14.5, 23.3]	24 [15, 32.5]	0.459
Aspartate aminotransferase (IU/L)		24 [19.3, 31.8]	29 [19.5, 45]	0.458
Bilirubin (mg/dl)		0.74 [0.51, 0.86]	0.63 [0.49, 1.16]	0.97
Platelet count (x10^3/μl)		181.5 [148.3, 218.50]	181 [128, 207.5]	0.833
Prothrombin activity (%)		100.5 [91.5, 106.5]	86.0 [77.5, 99.0]	0.057
ICGR 15 (%)		8.70 [7.60, 14.70]	7.00 [4.92, 12.50]	0.327
Disease (%)	Hepatocellular carcinoma	4 (40.0)	6 (54.5)	0.85
	Liver metastasis	4 (40.0)	3 (27.3)	
	Other	2 (20.0)	2 (18.2)	
Operation method (%)	Posterior segmentectomy	7 (70.0)	4 (36.4)	0.342
	Right lobectomy	3 (30.0)	4 (36.4)	
	Right tri-segmentectomy	0 (0.0)	1 (9.1)	
	Sub-segmentectomy	0 (0.0)	2 (18.2)	
Repeat hepatectomy (%)		6 (60.0)	5 (45.5)	0.67
Total operation time (min)		303.5 [250.3, 342.3]	257 [223.5, 295.5]	0.398
Complete mobilization time (min)		81 [50.8, 88.3]	110 [82.0, 152.5]	0.041
Postoperative complication (%)		6 (60.0)	8 (72.7)	0.659
Hospitalization (day)		11.5 [9.5, 14.5]	14.0 [12.5, 25.0]	0.044

Data are expressed as median [25 percentile, 75 percentile] and number (percent) except for age and body mass index as mean ± standard deviation. Mann–Whitney U test, Student t test, Fisher's exact test and Chi-squared test were employed to compere two groups.

Abbreviations: HBV; hepatitis B surface antigen, HCV; hepatitis C antibody, NBNC; negative of hepatitis B surface antigen and hepatitis C antibody, ICGR15; indocyanine green retention rate at 15 min.

Nonetheless, the present study demonstrates the feasibility of "Acrosurg." for mobilization of the liver in cases of right side hepatectomy, because the time taken for complete mobilization can be shortened and the short hepatic veins safely transacted by "Acrosurg." alone during the mobilization.

Conflicts of interest

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

Acknowledgments

None.

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