

## Comparison of Various Methods of Vessel Ligation: What is the Safest Method?

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**Research Purpose:** A surgeon's tie ligation has been used as the standard methods in achieving hemostasis during operation. Recently, various hemostatic devices such as metal or plastic clips, ultrasonic coagulating shears, and electrothermal bipolar vessel sealer are widely applied. However, there have been only a few studies to support the effectiveness and security of these new devices. The purpose of this study was to analyze the mechanical, histological, and biochemical differences of vessels sealed with various hemostatic devices.

**Materials and Methods:** Thirty New Zealand White rabbits were randomly allocated into 5 groups, and short gastric vessels were ligated with Hemo-clip (HC), Hem-o-Lok clip (HL), Harmonic Ace (HA), Ligasure (LS), and tie ligation (TL). These vessels were harvested 3 days after operation and histologically analyzed at the site of ligation (proximal) and 5 mm apart (distal). Perivascular fibrosis was assessed in a score of 0 to 3 according to the severity. Inducible nitric oxide synthase (iNOS) and endothelial nitric oxide synthase (eNOS) RNA expressions were measured quantitatively by real-time PCR at the sites of ligation. Abdominal aorta and inferior vena cava were also harvested and divided with each tools, and bursting pressures were measured.

**Results:** Overall 91 short gastric vessels were analyzed histologically. Degree of perivascular fibrosis was not statistically different either proximal (HC: 1.71±0.69; HL: 1.89±0.76; HA: 1.29±0.59; LS: 1.68±0.75; TL: 1.63±0.60, p=0.250) or distal (HC: 1.29±0.47; HL: 1.44±0.51; HA: 1.18±0.39; LS: 1.33±0.59; TL: 1.47±0.70, p=0.381) sites between groups. The mean expression of iNOS were significantly lower in LS group (HC: 388.58±57.34; HL: 294.94±37.61; HA: 304.05±67.52; LS: 189.41±44.49; TL: 322.24±55.35, p<0.001), and those of eNOS were also significantly lower in LS group (HC:

3.27±0.49; HL: 3.44±0.92; HA: 2.63±0.78; LS: 1.93±1.63; TL: 3.41±0.53, p<0.001). Bursting pressures were measured in 164 arteries (mean outer diameter: 2.58±0.67mm) and 141 veins (mean outer diameter: 3.46±0.91mm). LS group showed significantly lower bursting pressures (mmHg) in arteries (HC: 709.37±317.16; HL: 548.02±277.71; HA: 410.29±265.49; LS: 258.14±194.43; TL: 763.56±273.85, p<0.001), and HL group showed significantly lower bursting pressures in veins (HC: 366.10±216.59; HL: 79.84±47.04; HA: 191.64±96.54; LS: 131.22±64.06; TL: 647.41±325.79, p<0.001). There were negative relationship between outer diameters and bursting pressures both arteries (rho=-0.505, p<0.001) and veins (rho=-0.106, p=0.240).

**Conclusions:** There were no acute histological differences between hemostatic devices. However, LS showed lowest iNOS and eNOS expressions, which might be due to thermal injuries of whole vessel wall. There might be no clinical limitations in applying various hemostatic devices at small vessels under physiologic blood pressures. However, clinicians need to be careful in application of LS at larger artery and HL in larger veins.

## The Significance of CA 19-9 for Predicting Survival and Recurrence in Intrahepatic Cholangiocarcinoma Patients Treated with Curative Resection

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**Aim:** To investigate the significance of carbohydrate antigen 19-9 (CA19-9) levels for predicting survival and recurrence in intrahepatic cholangiocarcinoma treated with curative resection

**Methods:** we retrospectively reviewed data from 77 intrahepatic cholangiocarcinoma patients treated with surgical resection at NCC between April 2001 and July 2010. CA19-9 levels (pre-, postoperative and recurrent CA19-9) and their decline were analyzed for patient distribution and survival.

**Results:** Before surgical resection, there were 46 patients who had elevated CA19-9 levels (37~100