

## CHAPTER II

### LITERATURE REVIEWS

#### 2.1 Current status of laparoscopic cholecystectomy

Laparoscopic cholecystectomy has been considered as the procedure of choice to manage symptomatic gallstone patients. The success rate, ranging from 84 to 98 per cent, depends on patient selection, gallstone status and experience of operators.<sup>23, 24</sup> In uncomplicated gallstone the expected success rate is 95 per cent. Conversion to open cholecystectomy is more frequently required in the presence of acute cholecystitis<sup>25</sup> or marked fibrosis around Calot's triangle from previous infection and chronic cholecystitis<sup>26</sup>. Less postoperative pain was reported as compare to open cholecystectomy<sup>27</sup>. Laparoscopic cholecystectomy also provided a shorter hospital stay and earlier returned to normal activities than open cholecystectomy.<sup>28, 29</sup>

Laparoscopic cholecystectomy is generally performed under general anesthesia using TPC at 12-15 mm. Hg. The general complications of laparoscopic cholecystectomy were shown in Table 2.1

Table 2.1 Complications of laparoscopic surgery.

Complications	Percentage	References Number
Mortality	0.04-0.08	9, 30
Postoperative hemorrhage	2.0	31
Retained common bile duct stones	0.7	31
Wound infection	0.3-1.7	32, 24
Trochar site hernia	0.15	33
Deep vein thrombosis	1.0	24
Pulmonary complications	0.7-2.6	31, 34
Bile leak	0.3-2.2	30, 34
Bile duct injury	0.3-1.1	9, 35

The specific complications of laparoscopic cholecystectomy were bile leak, retained CBD stone and bile ducts injuries. Bile leak was reported with incidence of 0.3-2.2 per cent.<sup>(30,34)</sup> Bile duct injury, which was the most catastrophic complication, was at 0.3-1.1 per cent<sup>(9,34)</sup>. Retained common bile duct stone should be as the same incidence as in open cholecystectomy, the acceptable rate of retained stone was around 2 per cent<sup>(35)</sup>.

## 2.2 Hemodynamic consequences of TPC

The effects of TPC were divided into 2 categories: mechanical effect due to increased intraabdominal pressure and effects of systemic absorption of CO<sub>2</sub> <sup>(11,36-38)</sup>. Venous return is decreased by intra-abdominal pressure of 10-15 mm. Hg <sup>(39)</sup>. In laparoscopic cholecystectomy, the head-up position is used, venous return is further impeded <sup>(40)</sup>. Although the changes could be compensated in the normal patients, patients with sudden cardiac arrest during CO<sub>2</sub> insufflation <sup>(41)</sup> were occasionally reported in the literature.

Cardiac performance is affected by TPC, stroke volume is decreased as a result of decreased venous return and increased arterial resistance <sup>(11,38,43)</sup>. However, heart rate may increase as a result of CO<sub>2</sub> effect.

Increased intraabdominal pressure affected the splanchnic blood flow and there were many reports of decreasing blood flow to stomach, <sup>(43)</sup> kidney, <sup>(44)</sup> and liver <sup>(45)</sup>. Decreased in urine output during the laparoscopic surgery was reported <sup>(46)</sup>. Minimal gas embolism, detected by esophageal echocardiography, occurred commonly during laparoscopic cholecystectomy, but caused minimal cardiorespiratory effect <sup>(15)</sup>. However, many cases of fatal or near fatal gas embolism were reported <sup>(14,16,47,48)</sup>.

### 2.3 Reviews of descriptive studies on AWL technique.

TPC has adverse effects of increased intra abdominal pressure and absorption of CO<sub>2</sub> and has potential of fatal gas emboli. These adverse effects may be diminished or eliminated by AWL technique. The early reports of AWL technique were case series. They showed the feasibility of AWL technique, and claimed that AWL provided stable hemodynamic outcomes. <sup>(17,20,49,50)</sup> A review of the studies was shown in Table 2.2

Table 2.2 A review of descriptive reports on AWL technique.

First Author (s)	Year	patients	Aspect of benefit	Reference number
Nakai H.	1992		feasibility	49
Kitano S.	1992		new instrument	50
Araki K.	1993	151	feasibility, hemodynamic	17
Hashimoto D.	1993	40	feasibility	20,51
Tsoi EMK,	1993	29	feasibility, hemodynamic	21
Paulucci V.	1995	54	feasibility	53
Couture P.	1997	15	hemodynamic	54
Yokamori K	1998	24	feasibility in Pediatric surgery	55
Carry PY	1998	9	respiration	56
Banding S	1993		feasibility of low pressure pneumoperitoneum	19

#### 2.4 Reviews of randomized controlled trial on laparoscopic cholecystectomy using TPC and AWL technique.

After searching Medline on internet site at [www.ncbi.nlm.nih.gov/](http://www.ncbi.nlm.nih.gov/), 16,508 documents were retrieved after searching for laparoscopic surgery. After limitation with “laparoscopic cholecystectomy” and “randomized controlled trial”, 144 documents were retrieved. Only 10 papers were the randomized controlled trials on laparoscopic cholecystectomy comparing TPC and AWL. These 10 papers were reported from 5 centers in 3 countries. The study from Netherlands<sup>(57)</sup> indicated that the view was impaired during use of the AWL and therefore its use was difficult and time consuming. Possible advantages of AWL on hemodynamic and ventilatory parameter could not be confirmed in this study. However, the sample size in this study (20 cases) was too small.

There were 6 papers from one center in Finland<sup>(58-63)</sup> These papers might come from one RCT, which studied in many aspects. The maximal sample size from this center was 30. The outcomes about hemodynamic data, ventilatory variables, urine output and stress hormones were statistically significantly different between the 2 groups in favour of AWL technique. Koivusalo AM.<sup>(62-63)</sup> concluded that the AWL method ensured stable hemodynamics, prevented respiratory acidosis and provided protection against the renal and splanchnic ischemia seen with CO<sub>2</sub> pneumoperitoneum. Postoperative drowsiness was significantly longer duration in TPC than AWL group. The reports were mostly in anesthesiologic aspects, there were no results in success rate, postoperative pain and in other surgical aspects.

The other 3 papers were from 3 centers in Japan <sup>(64 - 66)</sup>. They studied on cytokine response (n=17), hemodynamic and stress response (n=20). There were no statistically significant differences between the two groups in stress response. However, AWL provided more stable hemodynamic outcomes.

There was only one RCT, which provided information in surgical aspects. Kitano S. <sup>(66)</sup> reported success rate of 88.1 per cent (37/42) in TPC group and 100 per cent (41/41) in the AWL group using U-shaped retractor elevation. Average operative time was 62.1 min in TPC group and 52.9 min in AWL group. All 5 patients with conversion to open surgery were belonging to the TPC group. The better success rate, especially in fibrotic gallbladder, might come from the ability to use the ordinary surgical instruments. The ordinary surgical instruments usually could not be used through the small incisions. Larger incisions might compromise the principle of minimal invasive surgery. Minilaparotomy cholecystectomy is another technique of surgical management for gallbladder stones. However, it was beyond the scope of this study. Kitano S. recommended using AWL procedure for severe fibrotic gallbladder and using TPC in the patients with little inflammation (of gallbladder). There was no explanation why he did not recommend using AWL (U-shaped retractor) in all cases.

Another randomized controlled trial should be performed to compare the clinical benefits of TPC and AWL techniques.