

General Session-IV**Trauma-II****Monday, 10 May, 14:30–15:45 hours****Chair: Kwo-Syin Wang, Tetsuo Yukioka****G-15****Serial AKBR Measurements after Hemorrhagic Shock and the Degree of Hepatic Mitochondrial Damage**

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Introduction: During a profound and prolonged shock, hepatic mitochondria yield to severe, functional, and structural damage that may not recover quickly after fluid resuscitation. It is difficult to assess the mitochondrial damage through conventional hepatic functional tests. Arterial ketone body ratio (AKBR) is a parameter that reflects hepatic mitochondrial redox status, and closely correlates with hepatic energy production, which is a fundamental function of liver mitochondria. Effects of massive hemorrhage on hepatic mitochondrial function with or without cirrhosis were studied by serial measurement of AKBR.

Methods: AKBRs were measured repeatedly in three groups, A, B, and C. Group A consisted of 30 trauma victims admitted due to hemorrhagic shock (systolic blood pressure (BP) <80 mmHg), without any liver disease. Group B were cirrhotic patients admitted due to ruptured esophageal varices, without shock between 1993 and 1998 (n = 24). Group C consisted of cirrhotic patients admitted due to ruptured esophageal varices with shock between 1993 and 1998 (n = 14). The AKBR recovery rate was calculated from the gradient of initial recovery and expressed as AKBR/24 hours.

Results: On admission, average systolic BPs were 65 ± 3, 122 ± 3, and 66 ± 3 mmHg; AKBRs were 0.29 ± 0.04, 0.49 ± 0.04a, and 0.27 ± 0.04; and, AKBR recovery rates were 2.28 ± 0.52, 0.21 ± 0.04^a, and 0.06 ± 0.05^{a,b}, in groups A, B, and C, respectively (Mean ± SEM^{a,b} significant vs. Groups A, B, respectively; p < 0.05). The AKBRs of Groups A and C on admission to the hospital were decreased highly, which reflected reduced hepatic mitochondrial redox status during the shock. After resuscitation, the AKBR levels recovered quickly in Group A, which indicated temporary mitochondrial dysfunction that was due to extrinsic reasons, indicated by markedly decreased AKBR. Although resuscitation was similarly successful, the AKBR recovery rate was low in cirrhotic patients, particularly in those with shock (Group B), which indicated hepatic mitochondria yielded intrinsic damage.

Conclusion: Hepatic mitochondria in cirrhotic patients, are vulnerable to massive hemorrhage, particularly after

profound shock. Serial measurement of AKBR enables assessment of the degree of hepatic mitochondrial damage and the extent of the deterioration in hepatic energy metabolism during and shortly after hemorrhagic shock. **Keywords:** Arterial ketone body ratio (AKBR); assessment; measurements; blood pressure; cirrhosis; hepatic damage; hypovolemia; liver; mitochondrial damage; shock, hemorrhagic; trauma

G-16**Socio-Economic Impact of Stab and Gunshot Wounds: A Descriptive Study on Patients Admitted to Manila Central University Hospital**

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One hundred fifty-eight (158) consecutive stab and gunshot victims were admitted to the Department of Surgery, Manila Central University Hospital (MCUH) from 01 October, 1997 through 31 October, 1998. Ninety-four percent (94.3%) of the victims were male with ages ranging from 16 to 60 years (mean age = 26 years). These incidents usually were caused by fights (63.0%), and frequently were related to alcohol intake. The average hospital stay was 8.2 days that cost an average of 1,109.92 pesos (US\$ 27.74*) per day if a minor operation was required, and 4,552.67 pesos (US\$ 113.82*) per day for a major procedure. Total expenses for a patient admitted to the clinical division (clinical service) averaged 23,215.73 pesos (US\$ 580.39), and 70,317.95 pesos (US\$ 1,757.95*) if admitted as a private patient. Specific components of hospital expenses were analyzed and suggestions made for lowering costs. Employed patients lost 1,197.00 pesos income** (US\$ 29.92*) and 6.2 work-days on the average while hospitalized with an average total loss of 3,440.00 pesos (US\$86.00) and 24 work-days during convalescence.

Recommended steps for reducing cost include prevention and education based on knowledge of causes, government subsidies, and upgrading of health insurance programs.

* Based on foreign exchange rate of 1 US dollar = 40 Philippine pesos.

** Average minimum daily wage of 150 pesos (US \$3.75).

Keywords: costs; demography; education; gunshot wounds; insurance, health; Manila; prevention; socio-economic impact; stabbing; subsidies; trauma;

G-17: Splenic Preservation Using a Harmonic Scalpel and Linear Stapler

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Introduction: From the standpoint of immunologic importance, splenic preservation is essential at the time of splenic injury. The maneuver often is time-consuming and intricate, because it is easy-to-tear the capsule and the parenchyma.

Purpose: To evaluate the safety and the efficacy of splenic preservation, by using a Harmonic Scalpel (HS) and a linear stapler. The former is an ultrasonic coagulating dissector, and has proved effective in dividing small vessels with minor thermal lateral injury. An adjustable linear stapler (ALS) was developed first to avoid injury when stapling bronchi. We have used an ALS safely in stapling the pancreas, adjusting the gap distance gradually to fit the thickness of the organ.

Methods:

Method 1 — Male Yorkshire pigs (about 20 kg) underwent laparotomy under general anesthesia. The splenic parenchyma was then transected by scissors, 10 cm from the lower pole. **Group A:** Short gastric vessels and inferior branches of the splenic artery and vein were coagulated and divided by using an HS. The splenic parenchyma then was stapled with an ALS and resected at the site of maximum thickness of the spleen. **Group B:** The same vessels as for Group A were ligated and divided. The splenic parenchyma then was sutured at the site of maximum thickness of the spleen. A hemisplenectomy was accomplished by using an electric cautery.

Method 2 — A laparoscopic partial splenectomy was performed on three pigs, using an HS and surgical staplers.

Method 3 — Report of a clinical case.

Results:

- 1) In Group A, all the vessels were divided safely, and complete hemostasis including the surgical margins of the splenic parenchyma was noticed. In Group B, three cases needed some added suture or electric coagulation to obtain complete hemostasis, and about 15% hypotension was recorded in one. The entire operation times were short ($p < 0.05$), and the amount of bleeding was less ($p < 0.05$) in Group A, but no statistically significant difference in thickness of the surgical margin and weight of the resected spleen between the two groups was noticed.
- 2) In laparoscopic partial resection, the hemostasis of the vessels and parenchyma was almost complete.
- 3) Concerning clinical use, the efficacy was evaluated in one patient with multiple-traumatic injuries: a 46-year-old male with bilateral pulmonary and kidney injuries, multiple liver injuries, lower parenchymal splenic injury, and open fractures. Surgical stapler was used in this case, and the hemostasis was complete.

Conclusion: We conclude that splenic preservation using HS and ALS proved to be safe and effective in porcine splenic trauma model. In clinical use, we have experienced successful partial resection using the HS and a surgical stapler.

Keywords: harmonic scalpel; laceration of the spleen; linear stapler; splenic preservation; trauma; trauma model

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Heat Injuries: The SAF Experience

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Introduction: Singapore's sunny weather, coupled with its high humidity and intense training in the Singapore Armed Forces (SAF), makes Heat Injury (HI) the most-common environmental emergency seen by doctors in the SAF.

Aim: This study was done to examine HI in the SAF, and how its occurrence correlates with the Wet Bulb Globe Temperature (WBGT), and the nature and timing of the Training Activities.

Method: This is a retrospective study of HI cases that occurred in the SAF over an 18-month period from January 1997–June 1998. The records were reviewed and the patient's particulars, initial and final diagnoses, the presenting rectal temperature and the corresponding WBGT, and the preceding activity were obtained.

Results: 138 cases of HI were recorded over the study period. There were no deaths. There were 115 (83.3%) victims with heat exhaustion, 13 (9.4%) with heat stroke, and four (2.9%) and six (4.3%) with heat syncope and physical exhaustion respectively. These incidents occurred during training activities like military exercises (59 cases, 42.8%), standard obstacle courses (18 cases, 13.0%), physical fitness tests (24 cases, 17.4%), and route march (37 cases, 26.8%). Ninety percent (90%) of the cases occurred when the WBGT was more than 25.4° C, and this was considerably lower than for the previously reported western studies.

While most of the cases happened before 10:00 hours and after 16:00 hours during strenuous training, 78% (46 of 59) of which occurred during military exercises, occurred between 11:00 and 15:00 hours. This was due to the restriction of physical training between 11:30 and 15:30 hours that does not extend to the conduct of military exercises.

Conclusion: The differentiation between the various types of HI often is retrospective. Therefore, there is a need to have a common resuscitative protocol so that the worst case scenario always will be anticipated. More needs to be done to educate the trainers and the trainees with regards to the prevention, recognition, and first aid treatment for HI.

Keywords: differentiation; heat exhaustion; heat injuries; heat stroke; heat syncope; military; Singapore; temperature; weather; wet-bulb globe temperature

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Recurrent Trauma — Its Implication

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Introduction: Some patients who suffered from trau-