Patients and Methods

Eighty healthy, adult patients, of class I and class II of the American Society of Anesthesiologists (ASA) classification, from both sexes, and undergoing abdominal surgeries or orthopedic (total hip or knee) lasting for more than two hours and less than four hours. This study was done in Benha University hospitals after approval of the local Ethical Committee and obtaining an informed consent from each patient.

Patients with any of the following criteria were excluded from the study

* Younger than 20 years or older than 60 years
* Hepatic, renal, cardiac or metabolic disorders
* Fever
* Shock
* ASA physical status more than II or emergency procedure
* Weight of more than 100kg or less than 60kg
* Operations with expected durations of less than 2 hours or more than 4 hours

Patients included in the study were assigned randomly into one of the two following groups:

**Group I :( under general anesthesia)**

Subdivided into:

***Group Ia:*** this group was composed of 20 patients who received amino acids intravenously infusion at a rate of 250ml/hour (corresponding to 260kJ/h) for one hour before anesthesia and continuing throughout the first hour of anesthesia.

***Group Ib*** (control group): this group was composed of 20 patients who received corresponding volumes of nutrient-free saline solution intravenously infused for one hour before anesthesia and the first hour intra-operatively.

**Group II: (under spinal anesthesia)**

Subdivided into:

***Group IIa:*** this group was composed of 20 patients who received amino acids intravenously infusion at the same rate as in group Ia, for one hour before the inducion of spinal anesthesia and continuing throughout the first hour of anesthesia.

***Group IIb*** (control group): this group was composed of 20 patients who received corresponding volumes of nutrient-free saline solution intravenously infused for one hour before anesthesia and the first hour intra-operatively.

Routine preoperative assessment was done to the patients including: history, clinical examination, laboratory investigations (complete blood picture, kidney function tests, liver function tests and random blood glucose level). Chest x-ray, ECG was done for patients above 40 years.

The study protocol was explained to the patients and they received instructions on how to use a visual analogue scale for scoring of postoperative pain.

All patients received premedication of midazolam 1-3mg i.v. given one hour before induction of anesthesia in all groups.

Operating room temperature was maintained at 24oC, no warming devices were being applied except for ordinary surgical draping and all the infused fluids were kept at room temperature.

***Anesthetic protocol:***

The anesthetic protocol was standardized for all patients.

In group I the general anesthesia was induced with sleep dose of thiopental sodium (3-6 mg/kg), and maintained with isoflurane. Tracheal Intubation was performed after an i.v. bolus dose of atracurium (0.5mg/kg) & fentanyl 2µg/kg was given, and when the patient was fully relaxed. Mechanical ventilation was started and was adjusted to maintain end-tidal CO2 tension between 34-36 mmHg.

Anesthesia was maintained by 0.5-1% Isoflurane, with muscle relaxation maintained by atracurium 0.15mg/kg whenever needed as indicated by nerve stimulator.

After the end of surgery and recovery of neuromuscular blockade was indicated by nerve stimulator, 2.5mg neostigmine and 1mg atropine was administered intravenously for the complete reversal of the neuromuscular blockade.

Extubation was performed when the patient met the standard extubation criteria (regular spontaneous breathing, end tidal carbon dioxide <45 mmHg and SPO2 > 95% on room air), then was transferred to the post-anesthetic care unit (PACU) in which he/she was inspiring humid 40% oxygen in air.

In group II the spinal anesthesia will be induced with 25 µg fentanyl added to (2.5-3ml) heavy marcaine 0.5%.

**Standard monitoring:**

 Routine vital signs monitoring of heart rate, blood pressure, oxygen saturation, end tidal CO2 and ECG was continuously displayed.

**Temperature monitoring:**

Core body temperature was continuously monitored via rectal thermistor probe which was inserted 10-15 cm, to assure the detection of core temperature. Surface (skin) temperature was monitored with another probe fixed on the skin of the lumbar region.

Monitoring was started just before amino acids infusion (base line), and then continuously performed for six hours started just before the induction of anesthesia.

**Arterial blood gases and pH analysis:**

was done every 30 min. starting just before the starting of amino acids infusion till six hours from the induction of anesthesia.

**Laboratory measurements:**

serum cortisol, serum glucose and serum lactate were measured just before starting of amino acids infusion, before induction of anesthesia, immediately postoperative and 2 hours postoperatively.

**Postoperative** **Clinical** **assessment:**

All patients were assessed every 30 min in the first 2 hours postoperatively for the presence of pain and shivering.

Pain at rest was scored on the visual analogue scale (VAS) which consisted of an unmarked 100 mm line, with 0 mm representing no pain and 100 mm representing the worst imaginable pain. If VAS was more than 40mm, 75mg diclofenac Na i.m. injection was given.

Shivering was assessed using the following score:

|  |  |
| --- | --- |
| 0 | No shivering |
| 1  | palpable mandible vibration or ECG artifact |
| 2 | visible fasciculations of head and neck |
| 3 | visible fasciculations of pectoral muscles or trunk  |
| 4 | generalized shivering of entire body |

***(Holtzclaw, 1986)***

30mg mepridine i.v. injection was given if shivering score was more than 2.

**Statistical Analysis:**

 Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS for Windows, version 16, SPSS Inc.; Chicago).

All the data were expressed as means ± standard deviation or number & percentage as appropriate. Continuous data are reported as means ± standard deviation. One-way analysis of variance was conducted to detect differences among the four treatment groups with respect to parametric variables (Table 1). Categorical data are reportedas numbers and percentages and analyzed using Chi-square test as appropriate (Table 1 &13).

 Unpaired student’s t-test and paired student's-test were used for between group and within group comparisons respectively (either spinal anesthesia groups or general anesthesia groups) as appropriate. **P** values of less than 0.05 were considered to be statistically significant.