

Incidence of post-operative cardiac complications in cardiac patients undergoing urological procedures

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Abstract

Context: There are limited studies indicating the incidence of post operative morbidity and mortality in high risk patients. Urological procedures constitute a major portion of geriatric surgeries where a cardiac complication is almost inevitable and therefore this group was selected for this study purpose.

Aims: To compare the incidence of post operative cardiovascular complications during regional and general anesthetic techniques in patients with known cardiac risk undergoing urological surgeries.

Settings and Design: Prospective randomized double blind study.

Methods and Material; 40 patients aged above 50 years posted for elective urological surgeries were enrolled in the study after obtaining approval from hospital ethics committee and written informed consent from the patients. Patients were divided into two groups A& B. Group A (n=20) received general and group B (n=20) received regional anaesthesia (spinal/ Epidural). All the patients received standard premedication and their basal vitals (BP, HR, ECG pattern) were recorded. The same parameters were monitored in the post operative period at regular intervals.

Statistical analysis used: Student 't' test was used to test the significance of statistical difference in the variables between the two groups.

Results: The mean heart rate and the mean arterial blood pressure were increased ($P < 0.01$) in the general anaesthesia group. Group A showed 10% incidence of ECG changes and group B showed 35% incidence of ECG changes. But the changes in the hemodynamics were not significant.

Conclusions: There is no difference between regional anaesthesia and general anaesthesia regarding the post operative outcome after urological procedures with respect to hemodynamic changes.

Keywords: Post operative complications, ECG, HR, MAP, Urological surgeries

1. Introduction

Patients who undergo non cardiac surgery may be at risk for cardiac morbidity, not only intra operatively but also during their recovery period. This risk applies particularly to those patients with known cardiac or cerebro vascular disease; however, it may also apply to asymptomatic persons who are older than 50 years and who have the potential to develop atherosclerotic cardiovascular disease[1].

Prevention and recognition of postoperative cardiac problems following non cardiac surgery is an area of intense clinical and economic interest in the perioperative and critical care environments[1]. Cardiovascular problems occur with the highest frequency in patients with pre-existing cardiovascular disease (CVD) and those undergoing major surgical procedures.

Advancement in anaesthesia and surgery have made the management of high risk patient groups especially with cardiovascular disease relatively safe and easy. Despite this, complications related to cardiovascular system are a major cause of death and disability especially in the post-operative period. Numerous reports have appeared in the literature describing the incidence of cardiovascular complications in surgical patients undergoing general anaesthesia[3,4,5], yet the role of regional anaesthesia is not well evaluated.

There is less data available regarding the incidence of arrhythmias and other cardiac complications in the immediate post anaesthetic period. Buckley *et al*[6] in an electrocardiographic survey of 100 consecutive patients in the recovery

room observed 45 instances of arrhythmias –sinus tachycardia was present in 32 cases, the next most common arrhythmia was occasional premature ventricular contractions.

Thus, the 'High Risk Group' that is, patients with previous myocardial infarction, hypertension treated or untreated, controlled or uncontrolled, advanced age and presence of arrhythmias are found in the average urological surgical subjects. Their incidence and nature have not been well assessed as also their behavior in the immediate post-operative period. Many of these high risk factors are usually found in average urological patients. It is for this reason that this group has been enrolled for the present study.

2. Materials and Methods

2.1 Patients: This prospective study was undertaken in 40 elderly "High Risk" patients, presenting for various urological surgeries. High Risk status has been defined as patients as who have Age above 50 years, Hypertension controlled or uncontrolled, Preoperative Arrhythmias, Coronary artery heart disease, Valvular heart disease, Post CABG patients and Heart blocks or chambers hypertrophy:

A thorough preoperative evaluation by the Anaesthesiologist and cardiologist of all the patients were ensured. In addition a detailed history was obtained regarding angina and previous myocardial infarction. For each patient in both groups the following information was acquired and tabulated. Age, Sex, associated medical problems, Hypertension, ECG Changes and ECho cardiogram changes. Patients, who were being treated with beta-blockers continued to receive the same doses until the day of surgery and in the postoperative period.

These 40 patients were divided into 2 groups of 20 each are shown in table 1. They were divided into two groups. Patients under group 1 were subjected to general anaesthesia and patients in group II underwent surgery under regional anaesthesia. Among group II 10 patients were subjected to spinal and 10 patients to epidural anaesthesia as shown in table 2.

2.2 Pre-Operative Protocol: Informed consent was obtained from every patient. In both the groups the pre-operative cardiac and non-cardiac treatment was continued until the day of surgery All patients were pre-medicated with tab Diazepam 0.1 mg/kg .body Wt. at bed time, one day prior to surgery and at 6AM, on the day of surgery pethidine 0.5mg 1kg body wt, and phenergan 0.5mg/kg/body wt. were administered intramuscularly 1 hour prior to surgery.

2.3. Intra Operative Protocol

Group –I (General Anaesthesia): General anaesthesia was induced using Inj. Thiopentone sodium (3-5 mg/kg/body wt.) and intubation was facilitated with suxamethonium (1-2 mg/kg/body wt.) using a cuffed endotracheal tube either portex or Flexometallic tube (Armored). Two minutes prior to intubation 2% lignocaine (1 mg/kg/body wt) was given intravenously.

Muscle relaxant given was Inj. Pancuronium Bromide 0.08 mg/kg/body wt. as bolus followed by top up doses as and when required. Analgesia was provided with Inj. Pethidine and anaesthesia maintained with O₂: N₂O 33:66% using controlled ventilation. Halothane had been supplemented intermittently during the procedure. At the end of the procedure residual neuromuscular blockade was reversed with Inj. Neostigmine (0.04 mg/kg/ body wt) and Inj. Atropine (0.02 mg/kg/ body wt.).

Group II: Regional anaesthesia was divided into two sub groups. Group IIA for Spinal anaesthesia and group IIB for epidural anaesthesia.

Group IIA: Spinal anaesthesia was administered using 5% Xylocaine heavy with 25G disposable needle (Spinocaine). The procedure was carried out both in sitting and lateral position using 5% Xylocaine 1.5ml. Patients were preloaded with 500ml. of Ringer Lactate prior to spinal anaesthesia.

Group IIB: Epidural catheter was inserted in the L3.L4 inter space via a Tuohy needle using the loss of resistance technique. Following a test dose, epidural anaesthesia was activated using an initial test dose. If necessary additional incremental doses to a total of 25ml was administered. All patients were preloaded with 500ml of Ringer Lactate prior to procedure.

A drop in blood pressure during maintenance under regional anaesthesia was managed by increasing the infusion of rate of crystalloid, a head down tilt and O₂ by Nasal prongs. A fall in systolic blood pressure less than 100 mmHg was treated in addition to the above measures with Inj. Mephentaramine as 3mg incremental doses as and when required keeping the cardiac status in mind.

2.4. Intra Operative Monitoring

Intra operatively in both groups monitoring included heart rate, non invasive automated blood pressure (N.I.B.P) and E.C.G. (lead II Datex cardiocap monitor). In addition to the above in group I general anaesthesia monitoring included ETCO₂, tidalvolume, respiratory rate and airway pressures (Manley servo ventilator MS2000). Dysrhythmias occurred in the intra-operative period they were treated with appropriate therapy and a record of the same made.

2.5 Post operative monitoring: In the post-operative period all patients were monitored for systolic blood pressure, Diastolic –blood pressure, Mean arterial blood pressure, (by sphygmomanometer) heart rate by continuous ECG monitoring and a 12 lead E.C.G was taken. The haemodynamic variables were monitored every 15 minutes initially up to 2 hours, followed by 1 hour intervals for four hours (total six months). E.C.G.(Page writerxle-Hewlett- Packard) was taken at ‘0’, ‘6’,’12’,’24’, (‘0’ post-operative day), 48 and 72 hours in the post-operative period. E.C.G. was analyzed for arrhythmias (Ectopics) and ST-T wave changes.

2.6 Clinical out Come Analysis

A post –operative cardiac complication was defined as the appearance of fresh changes on the E.C.G as arrhythmia or ST, T wave changes. ST-T wave change was defined as a new ST-T abnormality (ST depression or elevation greater –than 1 mm or T-wave inversion) on a 12 lead E.C.G recording. A rhythm change and an appearance of Ectopic (atrial or ventricular) was recorded as a fresh change in the E.C.G.

2.7 Statistical Analysis

We studied 40 patients for their cardio vascular morbidity using E.C.G and haemodynamic parameters and standard descriptive statistics were used to characterize each variable. Statistical analysis to compare the variables (Age, Heart rate, Mean Arterial blood pressure) between the two groups was made by students ‘t’ test. Haemodynamic variable (mean heart rate and mean arterial blood pressure) at different periods within the groups were analyzed by comparing with the ‘O’ value (base line value). The data presented in the test and tables as mean (standard deviation).

‘P’ value of < 0.05 was considered to be as indicative of statistical significance and a ‘p’ value of >0.05 was considered as non significant. P values of <0.01 and <0.001 as highly significant and very highly significant respectively.

3. Results

3.1 Demographic Data: The pre-operative demographic data (age, weight and sex) shown in the table 1, 2 Fig 1 and 2.

Table 1: Demographic distribution data for 40 patients(GA 20pts +RA 20 pts)

S.No	Data	Group I	Group II	P Value
1	Type of Anaesthesia	G.ANAE	R.ANAE	
2	No. of Patients	20	20	
3	Age Years	60.95+6.9	64.1+11.8	N.S
4	Weight (kgs)	65.3+ 9.8	62.65+12.17	N.S
5	Sex	14.6	20.0	

Table 2: Demographic distribution data for 20 RA patients (SA 10 pts+EA 10 pts)

S.No	Data	Group II A Spi. anae	Group II B Epi. Anae	P Value
1	No. of Patients	10	10	
2	Age Years	64.9 +12.29	63.3+10.56	N.S
3	Weight (kgs)	64.2+ 11.56	61.1+13.18	N.S
4	Sex	Male	Male	
5	Drug	Xylocaine	Xylocaine	

N.S= Not Significant

Figure 1: Demographic data General Vs Regional Anaesthesia

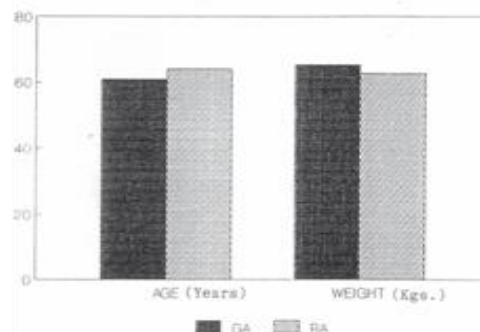
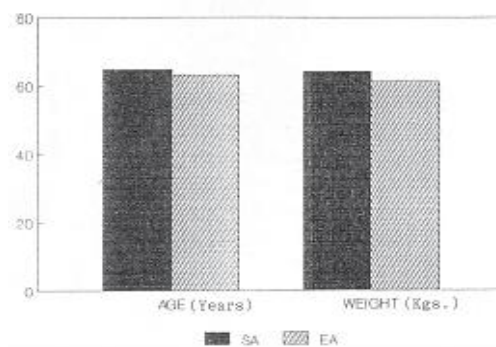


Figure 2: Demographic data Spinal vs Epidural Anaesthesia



Group I (G. Anae): The mean age of the 20 patients who underwent general anaesthesia was 60.95±6.9. Their mean weight was 65.3±11.18. Their sex ratio was 14:6.

Group II (R. Anae): The mean age of this group patient was 64.1±11.18. Their sex ratio was 20:0.

Sub Groups: The mean age of patients receiving group IIA (Spinal) and group IIB (Epidural anaesthesia) was 64.9±12.29 and 63.3±10.56 respectively, and weight 64.2±11.56 and 61.1±13.18. It was found that these two groups were comparable except for sex distribution.

Table 3: Pre-operative Problems: pre-operative clinical data for 40 patinets

Problems	G. Anaes	R. Anaesthe	Spinal Anae	Epi. Anae
Hypertension	19	16	8	8
Old myocardial infaction	1	12	7	5
Valvular heart lesions		5	2	3
Hypertrophy heart chambers	2	7	3	4
Heart blocks	1	1	1	-
Post CABG	-	1	1	-

The commonest problem was hypertension in both the groups. In the group II old myocardial infarction was the second commonest among whom one patient had already undergone coronary artery bypass graft surgery.

Table 4: Pre-Operative E.C.G. changes for 40 patients

ST-wave Changes	4	7	3	4
Sinus Tachycardia	1	1	1	1
Q' wave Changes	1	4	2	2
Bundle branch block	1	1	1	0
Ventricular Hypertrophy	3	3	1	2

Table 5: Urological Problems and Procedures

Problem	Procedure	G.A	R.A	S.A	E.A
B.P.H	TUR(P)	1	14	9	5
Uretric Stone	Uretroscopy	5	3	-	3
Renal Stone	PCNL	11	1	-	1
Ca Bladder	Resection of neck	-	1	-	1
Stricture Urethra	IU	-	1	1	-
Renalcell Carcinoma	Radical Nephrectomy	1	-	-	-
V.V.F	Repair	2	-	-	-

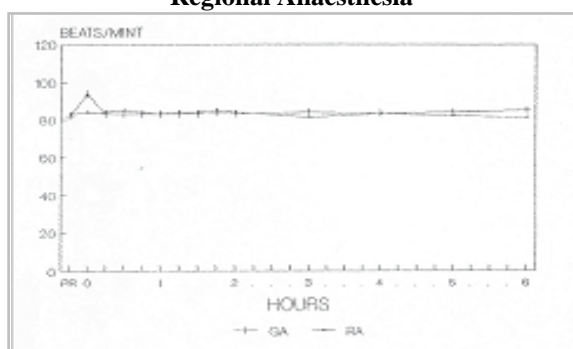
In group I commonest urological procedures was percutaneous nephrolithotomy, where as in group II trans urethral resection of prostate.

3.2 Post operative Cardiovascular Changes

3.2.1 Change in Mean Heart rate:

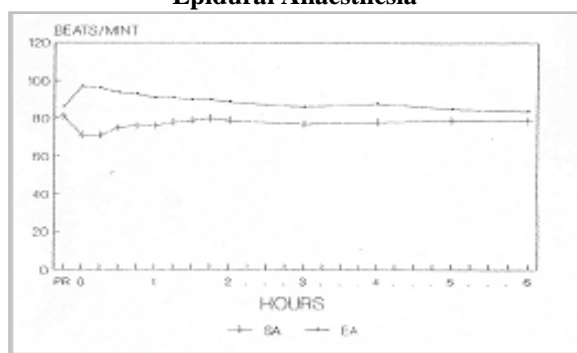
a) General anaesthesia versus Regional anaesthesia: (figure 3): The mean heart rate of the general anaesthesia and regional anaesthesia groups were shown at different time intervals. In general anaesthesia group the mean heart rate was significantly increased at immediate post-operative period (0 hour-base line value) from pre-operative period. Thereafter there was no significant change in the mean heart rate at any of the time intervals. In the regional anaesthesia groups there was no significant change in the mean heart rate at any of these time interval. The mean heart rate response of general anaesthesia at 0 hour (base line value) when compared with regional anaesthesia showed a significant increase (p<0.01). Thereafter in both the groups no change occurred at any of the time intervals.

Figure 3: Changes in mean heart rate General Vs Regional Anaesthesia



b) Spinal Anaesthesia versus Epidural Anaesthesia: (Figure 4): In spinal anaesthesia there was significant fall in the heart rate at immediate post-operative period (base line value) from pre-operative period. Thereafter no significant change occurred. In epidural anaesthesia there was significant increase in heart rate at immediate post-operative period from pre-operative period. Thereafter no significant change was noticed. The mean heart rate response of spinal anaesthesia compared with epidural anaesthesia at '0' hour (base line value) showed a significant difference between baseline values of the two minutes in the post-operative period.

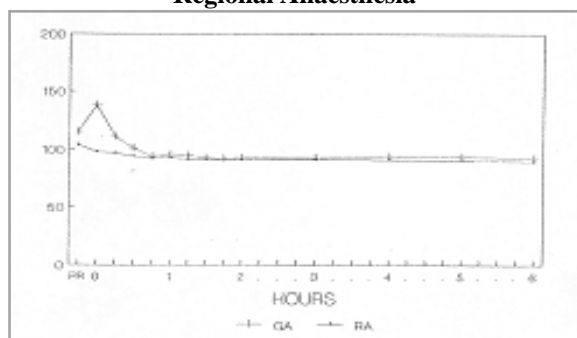
Figure 4: Changes in mean heart rate – spinal Vs Epidural Anaesthesia



3.2.2. Change in Mean arterial blood pressure:

a) General anaesthesia versus Regional anaesthesia: (Figure 5): In general anaesthesia there was significant increase in the mean of the MAP at immediate post-operative period (base line value '0'hour) from pre-operative period. Thereafter it remained stable and no changes were observed. In regional anaesthesia there was no change in mean of the MAP. The mean of the MAP response of general anaesthesia when compared with regional anaesthesia at '0' hour (p<0.01). Thereafter MAP alteration continued to be insignificant in both groups as proved by p>0.05.

Figure 5: Changes in M.A.B.P- Genral Vs Regional Anaesthesia

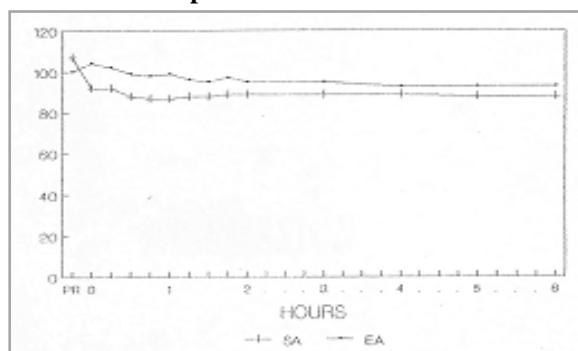


b) Spinal Anaesthesia versus Epidural Anaesthesia: (Figure 6): In spinal anaesthesia there was significant fall in the mean of the mean arterial pressure at '0' post-operative period (baseline value)

from pre-operative value. Thereafter there was no significant change.

In epidural anaesthesia there was no significant change in the mean of the MAP of the spinal anaesthesia with Epidural anaesthesia at different time intervals. There was significant difference between the base line values of the two groups ($P < 0.05$) and this difference in pressures was present till one hour in post operative period.

Figure 6: Changes in M.A.B.P- Spinal Vs Epidural Anaesthesia



3.2.3 Post Operative ECG Changes

ECG abnormalities occurred in 9(22.5%) of the 40 patients in the post operative period at different time intervals in both the groups. Of these 3 (7.5%) developed new ECG abnormalities in the post operative period, while 6 patients(15%) had ECG abnormalities before operation. Of the 9 patients in whom ECG changes were noted ST-T wave changes were detected in 8 patients and VPC's in one patient. Out of the 40 patients 23 patients (57.5%) had preoperative ECG abnormalities in which 9 patients belonged to the general anaesthesia group and 14 to the regional anaesthesia group. A total of 26 episodes of ST-T changes and VPC's were identified. The incidence of ECG changes in the immediate 24, 48 & 72 hours was 64.3%, 21.4%, & 14.3% respectively. 90% of these episodes were ST-T wave changes.

Group I (General Anaesthesia):

Out of the 9 patients only 2 patients (10%) developed post operative ECG changes at different time intervals. One patient had an episode of RBBB and Sinus tachycardia in the preoperative period and developed fresh changes of T- inversion at 12,24,48, and 72 hours. The second patient developed fresh ST-T wave change at 0,6,24 and 48 hours and ST-T changes with VPCs at 24th hour. These two patients had a history of hypertension and ECG changes in the pre-operative period.

Group II (Regional Anaesthesia)

Out of the 20 patients, 7 patients (35%) had developed ECG changes in the post-operative period of which 4 of them had pre-operative ECG changes and hypertension. 19 episodes(67.7%) occurred in

this group whereas there were only 9 episodes(33%) in the general anaesthesia group.

Group II A Spinal Anaesthesia

Out of the 10 patients in the spinal anaesthesia group 4 patients (40%) had developed post-operative ECG changes. Of these 4 patients one patient had pre-operative ECG changes with calcified valvular heart lesions. Of the remaining two patients had hypertension and one was tested positive for stress induced ischemia. Further, among these 4 patients one had episodes of ST wave changes at 24, 48 and 72 hours. Another patient had T wave inversion at 12th hour, and the 3rd patient had ST segment changes at the 12th hour. The 4th patient had couplets of VPCs at the 6th and 12th hours post-operatively.

Group IIB (Epidural Anaesthesia)

Three patients (30%) had developed ECG changes, all of whom had changes pre-operatively and two out of them were hypertensive. One patient had an episode of pseudo normalization of T inversion at 6, 12 and 24 hours and fresh T inversion at 48th hour. The second patient had developed ST-T wave changes at 24, 48 and 72 hours. The 3rd patient had developed fresh T inversion at 24, 48, and 72 hours.

Outcome: Two out of 40 patients had problems in the post-operative period. One patient had developed multiple PVCs and required ICCU care and was discharged after treatment. Another patient developed ST-T wave changes associated with continuous bleeding from urethra which was controlled by the 8th post-operative day.

4. Discussion

One of the most controversial subjects in anaesthesia today is whether or not regional anaesthesia is superior to general anaesthesia in "High risk" patients undergoing non-cardiac surgery. There are a number of studies and debates on this subject, but the controversy is still continuing.

It is apparent that the most serious morbidity and mortality actually occurs in the hours and days following non-cardiac surgery in high risk patients. The temporary discontinuation in vigilant monitoring in the immediate post-operative period has added a new dimension to the importance of continued vigilant monitoring.

The termination of surgery and anaesthesia followed by emergence and transition into the post-operative period is associated with continued activation of the sympathetic nervous system. Control of the hyper adrenergic state and the post-operative stress response has implications on cardiovascular system and may have an important impact on the

ultimate outcome. The presence of pain, anxiety, an endotracheal tube and physiologic derangements such as hypoxemia, hypercarbia, hypothermia, volume overload or depletion, all serve as potent stimulants to increase serum catecholamine levels, thus potentially contributing to a number of post-operative cardiovascular complications particularly in cardiac patients either undergoing regional or general anaesthesia. At the same time patients coming for urological surgical procedures are increasing, particularly high risk and elderly patients for endoscopic and non endoscopic surgeries and day care surgery and all these will certainly continue to present a challenge to the anaesthesia team.

Today there are only a few studies on the post-operative morbidity and mortality following urological procedures. Denney and Denson[6] in their study in TURP procedures have reported a complication rate of 2.6% up to 48 hours post-operatively and 21% beyond 48 hours but less than 30 days post-operatively. M. Gamil & Fanning[8] in their retrospective study in major elective urological procedures have reported a 17.2% incidence of post-operative problems with a morbidity of 0.24% at 24 hours, 0.3% at 48 hours and 0.8% at 30 days. There are no studies indicating the incidence of post-operative morbidity and mortality in high risk patients undergoing urological procedures, but a study was conducted by Driscoil *et al* in high risk patients undergoing non-urological procedures (abdominal, thoracic etc) and they have reported an incidence of 23% morbidity and 2.9% mortality.

In this study of 40 high risk group patients undergoing urologic procedures, there was no mortality, but 22.5% of the patients developed ECG changes in the post-operative period without any signs and symptoms.

It is well known that cardio respiratory problems are the most common causes for the post-operative morbidity and mortality. However, the recent widespread use of modern anaesthetic agents and techniques invasive cardio vascular and respiratory monitoring and the aggressive use of inotropic and vasoactive drugs in the peri operative period has dramatically brought down the incidence of post-operative morbidity and mortality.

The merits of both general anaesthesia and regional anaesthesia for patients undergoing non cardiac surgery have been studied. Currently there is a uniform preference for one form of anaesthesia over another in patients undergoing various surgical procedures. Each technique has both real and theoretical advantages for high risk patients undergoing surgical procedures.

However in this study the preponderance of evidence does not support these conclusions. Infact, a well conducted general anaesthesia is just as safe as regional anaesthesia and same had been proved in this study.

It was noted that 95% of patients were hypertensive (pre-operative). Of these, 25% were hypertensive in the immediate 3 post operative period and this was evident within the first 30 minutes but in a study done by GALTS, Cooperman LH, *et al.* they noted that 60% of their patients were hypertensive in the immediate post-operative period. The majority of our patients were receiving regular anti hypertensive therapy and did not have any post-operative sequelae.

Hypertension in the immediate post-operative period is often a benign self limiting phenomenon. This period furnishes many stimuli which may increase arterial pressure. Examples include tracheal suction, removal of an endotracheal tube, transfer from operating table to bed and rapid emergence from anaesthesia, often with minimal analgesia.

This study has shown that there were no hypertensive episodes in the Regional anaesthesia group. Except for the hypertension in the first 30 minutes following general anaesthesia, there were no subsequent differences either in heart rate or in mean arterial blood pressure between both the groups. In the general anaesthesia group there was increased mean heart rate from 81(pre-operative) to 84 in the immediate post-operative period. After 15 minutes the heart rate returned to baseline and it remained stable till 6 hours in the post-operative period. The mean of the mean arterial blood pressure was increased from 111 mmHg pre-operatively to 138mmHg in the immediate post-operative period. After 15 minutes it returned to base line values thereafter it fell to 93mmHg, and persistently remained stable till 6 hours post-operatively.

In the spinal anaesthesia group there were haemodynamic changes in the post-operative period. This may be due to profound sympathetic blockade. In this group the mean heart rate has fallen from 81 (pre-Operative) to 71 (immediate postoperative period). The mean of the mean arterial pressure has fallen from 107mmHg. (pre-Operative) to 92 mmHg in the immediate post-operative period. Thereafter the heart rate returned to baseline value, whereas mean arterial blood pressure was persistently low at about 88mmHg even at the end of 6 hours post-operatively.

In the epidural anaesthesia group there were no significant changes in both the heart rate and mean arterial blood pressure in the 6 hours post-operatively

and remained stable when compared with base line value as well as the spinal anaesthesia group.

This study documents the frequency and severity of post-operative ECG changes in high risk urological patients and draw a comparison between general anaesthesia and regional anaesthesia. Despite intensive medical therapy and post-operative care 22.5% of patients displayed episodes of transient ECG changes during a three day period of intermittent ECG monitoring in both the general and regional anaesthesia groups. All episodes were clinically silent and asymptomatic. One study conducted by Wrong *et al*[9] suggested that 27 -40% of high risk cardiac patients undergoing non-cardiac under general anesthesia developed ischemic changes.

The low incidence of changes in these patients may be due to the difference in patient population, medical therapy and different anaesthetic techniques used. Most episodes were not preceded by any haemodynamic changes, and were also not related to pre-operative ECG changes. They were independent and silent in nature (100%). The same was also proved in a study by Fegert *et al*[11] Cardiac enzymes were not estimated in this study. Some of the non specific ST-T segment changes may occur due to changes in the body temperature, serum electrolytes, ventilatory patterns or the influence of drugs[11]. Many of these patients were on beta blockers in the pre-operative period and the same were continued post-operatively. A comparison of post-operative ECG changes between the groups has shown that patients undergoing surgery under general anaesthesia had a 10% incidence of ECG changes while those who received regional anesthesia had a 35% incidence. The reason may be that more high risk patients were taken up under regional anaesthesia. There was not much difference between the spinal and epidural anaesthesia groups. In the present study most of the episodes occurred in first 24 hours post-operatively. The same had been reported by previous studies also.[12]

The results of this study suggest that regional anaesthesia in high risk patients undergoing urological surgery offers no major advantages or disadvantages when compared to general anaesthesia.

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