PREOPERATIVE TROPOIN I LEVEL AS A PREDICTOR OF POST OPERATIVE OUTCOME AFTER CARDIAC SURGERY VERSUS CORONARY ANGIOPLASTY

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Abstract:
Purpose:
Studies had been shown that the post operative morbidity and mortality after cardiac surgery increases in patients with positive preoperative cardiac Troponin I level (cTnI). Whether post angioplasty complications in these patients has equivalent effect was not determined.

Methods:
a combined prospective and retrospective study was done, patients with negative and positive preoperative troponin were detected and post operative complications were studied prospectively in the preoperative negative cTnI group control group 1) and positive cTnI who underwent cardiac surgery (positive for cardiac surgery group 2), the positive preoperative cTnI group who underwent angioplasty were retrospective studied (positive for angioplasty 3).

Results:
The incidence of postoperative complications in both group 2&3 were higher than the control group however there was no difference in the outcome whether patients with reoperative positive cTnI underwent cardiac surgery or angioplasty. Mortality rate was 13%, 14%and 5.3%in group 2&3 compared to the control group respectively as well as post operative myocardial infarction was 5%,4.5% and 1.8% respectively .

Conclusion:
Postoperative morbidity and mortality are similarly higher in patients with preoperative positive cTnI level whether they underwent cardiac surgery or coronary angioplasty (PTCA).
Introduction:
The significance of an elevation of Troponin level for possible myocardial ischemia and the overall outcome irrespective of subsequent management either medical or invasive therapy has been shown to have an impact with increasing in patients morbidity and mortality. This study was designed to look at those patients who are undergoing a surgical treatment versus coronary angioplasty with a positive Troponin level and post operative outcome compared to patients with negative Troponin preoperatively. (1) Troponin is a biochemical marker which is specific to the heart and is not expressed by the skeletal muscles (2) its high sensitivity and specificity making it a good diagnostic tool for a perioperative myocardial infarction. (3). Elements of myocardial injury were demonstrated during cardiac surgery due to surgical manipulation and trauma, inadequate myocardial protection and coronary thrombosis (4), Troponin release after PTCA has been shown in 13%-74% of the cases and it was associated with conditions that are likely to cause micro or macro vascular injury but its release has not been shown to predict post procedural mortality. (5, 6)

Methods:
A combined prospective and retrospective study was designed where Troponin I (cTnI) level was measured preoperatively. Total of one hundred and twenty patients were selected for the study they were divided into three groups ,sixty patients with preoperative negative cTnI level who underwent cardiac surgery considered as a control group (Group 1) ,thirty patients with a preoperative positive cTnI level who underwent cardiac surgery considered (Group 2) were studied prospectively and a third group of thirty patients with positive cTnI level who underwent coronary angioplasty (PTCA) were studied retrospectively . Blood samples for cTnI were drawn within 24 hours before the procedure and 12 hours and 24 hours after the procedures, the blood samples were analyzed by a Micro particle Enzyme Immunoassay (Axsys System Abbott,Abbott Park,Illinois) with a normal range of cTnI value from 0.00 to 2.00ng/ml. Preoperatively patients with a cTnI level <2.0ng/ml were considered negative and >2.0ng/ml were considered positive.

Patients with myocardial infarction diagnosed by ST segment changes and upward trend in cardiac enzymes were excluded as well as emergency catheterization and cardiac bypass. Clinical factors collected included demographic data and medical history. Post procedural data included mortality defined by death within 30 days as well as cardiac complications (myocardial infarction, low cardiac output and incidence of arrhythmias); patients were followed up in the ICU and floor until they were discharged home. Data are reported as mean +/- SD and categorical variables as No. (%). Comparisons of categorical variables between groups were performed by a PearsonX2 test while comparisons of continuous variables between groups were analyzed by Kruskal-Wallis test.

Results:
Preoperative cTnI level was measured in one hundred and twenty patients, sixty patients had negative level (<2.0 ng/ml) and sixty had positive level (>2.0 ng/ml). There were no significant difference in the demographic data between the 3 groups mean age was 62+/11 ,64+/10,63+/11 in groups 1&2and 3 respectively and female patients were 33%,28%and 24% respectively ,preoperative morbidity e.g. congestive heart failure (1% , 1.5%and 1.8% p=0.85)and Diabetes Mellitus (17%,20%and 22% p=0.07)respectively .(Table 1) Incidence of post operative morbidity and mortality was higher in group 2&3 with a positive preoperative cTnI level compared to group 1with negative preoperative cTnI but there was no difference in the outcome in both groups with the positive cTnI whether they underwent cardiac surgery or PTCA.

The mortality rate was 5.3% in group 1 compared to 13% and 14% in group 2&3, incidence of post procedural and post operative myocardial infarction, low cardiac output and arrhythmias were increased n group 2&3 as well , (Table 2).

Discussion:
The observation was that cardiac events after either cardiac surgery or coronary angioplasty in patients with evidence of myocardial injury as detected by preoperative positive Troponin levels is higher than patients with negative Troponin
levels preoperatively and with further myocardial injury that accompanied both procedures the outcome is significantly affected.

This study looked only at the cardiac events since several studies has been shown that there is an increase in Troponin level after either procedure emphasizing that there is a myocardial damage associated with either one ,other post procedural morbidities like for example renal failure may be secondary to the more invasive technical approach of the surgery than less invasive angioplasty. Significant myocardial injury during cardiac surgery is associated with 10 fold increase in post operative complications yet there is no gold standard for diagnosis. (7)

Troponin T and I are newer markers for myocardial necrosis than CK-MB and they improved the diagnostic criteria for detection of acute myocardial ischemia (8)

Lyon study showed that elevated preoperative Troponin T highlights a subgroup of cardiac surgical patients who are more likely to have postoperative course with increased morbidity and mortality (9). On the other hand studies had been shown that Troponin I release as determined at the end of CABG procedures represents a strong predictor of an adverse outcome after surgery (10).

Controversially Horvath concluded in his study that post operatively Troponin level increases in all cardiac surgeries and increases more with auto transfusion of shed mediastinal blood however he showed that there was no evidence of myocardial infarction by EKG or TEE and Troponin level is less meaningful after auto transfusion.(11)

Natarajan found that isolated Troponin I elevation without concomitant creatine kinase elevation following percutaneous coronary intervention did not predict events after hospital discharge. (12). Other study suggested that elevated Troponin levels on admission was associated with more extensive myocardial injury and predicted the clinical outcome that was associated with more complicated course following coronary angioplasty and these patients were found to have lower reperfusion rate and lower success rate for primary coronary intervention (13, 14)

In general clinical studies demonstrated that patients presenting with baseline positive Troponin have a higher risk of mortality compared with patients with later positive Troponin results.(15)

Although this study showed that the morbidity and mortality is the same after coronary revascularization by interventional and surgical methods in patients with a positive preoperative Troponin, but subsequent noncardiac surgeries are associated with similarly low rate of myocardial infarction and death after contemporary bypass surgery or angioplasty (16)

In conclusion the outcome after coronary revascularization either by interventional or surgical technique is the same in patients with preoperative positive Troponin.

Reference:


Table (1) Base line patient characteristics (Demographic data) Number % or Mean +/- SD, P*< 0.001

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group(1) Negative Troponin (n=60)</th>
<th>Group(2) Positive Troponin for cardiac surgery (n=30)</th>
<th>Group(3) Positive Troponin for PTCA (n=30)</th>
<th>P Value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>62 +/-11</td>
<td>64 +/-10</td>
<td>63 +/-11</td>
<td>0.01</td>
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<tr>
<td>Sex( Female )</td>
<td>33%</td>
<td>28%</td>
<td>24%</td>
<td>0.3</td>
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<tr>
<td>Hypertension</td>
<td>60%</td>
<td>65%</td>
<td>63%</td>
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<tr>
<td>Diabetes</td>
<td>17%</td>
<td>20%</td>
<td>22%</td>
<td>0.07</td>
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<tr>
<td>Mellitus</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>1%</td>
<td>1.5%</td>
<td>1.8%</td>
<td>0.85</td>
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<td>Hyperlipidemia</td>
<td>62%</td>
<td>65%</td>
<td>60%</td>
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<td>Smoking</td>
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<td>29%</td>
<td>21%</td>
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<tr>
<td>Obesity</td>
<td>32%</td>
<td>31%</td>
<td>32%</td>
<td>0.9</td>
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<tr>
<td>COPD</td>
<td>17%</td>
<td>20%</td>
<td>21%</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Table (2) Association between Troponin level and outcome (N= %)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group(1) Negative Troponin</th>
<th>Group(2) Positive Troponin for cardiac surgery</th>
<th>Group(3) Positive Troponin for PTCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>5.30%</td>
<td>13%</td>
<td>14%</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>13%</td>
<td>20%</td>
<td>18.3%</td>
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<tr>
<td>Low Cardiac output</td>
<td>1.5%</td>
<td>8%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>1.8%</td>
<td>5%</td>
<td>4.5%</td>
</tr>
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