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Non-cardiac surgery in patients with prosthetic heart valves: a 12 years experience

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NON-CARDIAC SURGERY IN PATIENTS WITH PROSTHETIC HEART VALVES: A 12 YEARS EXPERIENCE

Raja Parvez Akhtar, Abdul Rehman Abid,* Hasnain Zafar, Syed Javed Raza Gardezi,** Abdul Waheed and Jawad Sajid Khan

ABSTRACT

Objective: To study patients with mechanical heart valves undergoing non-cardiac surgery and their anticoagulation management during these procedures.

Study Design: It was a cohort study.

Place and Duration of Study: The study was conducted at the Department of Cardiac Surgery, Punjab Institute of Cardiology, Lahore and Department of Surgery, Services Institute of Medical Sciences, Lahore, from September 1994 to June 2006.

Patients and Methods: Patients with mechanical heart valves undergoing non-cardiac surgical operation during this period, were included. Their anticoagulation was monitored and anticoagulation related complications were recorded.

Results: In this study, 507 consecutive patients with a mechanical heart valve replacement were followed-up. Forty two (8.28%) patients underwent non-cardiac surgical operations of which 24 (57.1%) were for abdominal and non-abdominal surgeries, 5 (20.8%) were emergency and 19 (79.2%) were planned. There were 18 (42.9%) caesarean sections for pregnancies. Among the 24 procedures, there were 7 (29.1%) laparotomies, 7 (29.1%) hernia repairs, 2 (8.3%) cholecystectomies, 2 (8.3%) hysterectomies, 1 (4.1%) craniotomy, 1 (4.1%) spinal surgery for neuroblastoma, 1 (4.1%) ankle fracture and 1 (4.1%) carbuncle. No untoward valve or anticoagulation related complication was seen during this period.

Conclusion: Patients with mechanical valve prosthesis on life-long anticoagulation, if managed properly, can undergo any type of non-cardiac surgical operation with minimal risk.


INTRODUCTION

Rheumatic heart disease (RHD) is seen in endemic proportions in Pakistan with a prevalence of 5.7/1000.1 A large number of these patients are young and present late.1 Due to recurrent attacks of rheumatic fever (RF), their valves are severely diseased.2 In majority of patients, these valves are not suitable for percutaneous transvenous mitral commissurotomy (PTMC) or surgical repair,3 and this leaves the only option of valve replacement.2 Bioprosthetic or tissue valves in young patients with rheumatic fever are prone to early degeneration and valve failure leading to a revision operation.3 Hence, patients are left with mechanical valve prosthesis, for which life-long anticoagulation with Warfarin is required.

When patients with mechanical valves require surgery, their perioperative management of Warfarin therapy poses a major problem.4 These patients undergoing non-cardiac surgery have a thromboembolic (TE) event rate of 0-2% for aortic valve replacement and 11-20% for mitral valve replacement.5-7 Kearon et al. have reported a reduction in the incidence of TE events at the cost of increased major postoperative bleeds in patients receiving intravenous heparin.8 Risk of TE is from 1-22%.9-11

In order to assess TE and risk of haemorrhage, this study was conducted to evaluate the effect of our anticoagulation strategy on postoperative outcome of patients with mechanical heart valves undergoing non-cardiac surgery.

PATIENTS AND METHODS

All the patients who underwent valve replacement with a mechanical prosthesis for rheumatic heart disease from September 1994 till June 2006 were included in this cohort study. They were followed-up regularly in the author’s outpatient clinic. During follow-up period, their international normalized ratio (INR) and Warfarin dose was monitored and yearly echocardiography was done. Anticoagulation related events were also recorded.

Patients with a mechanical heart valve, requiring non-cardiac surgical operation for acute or elective procedure, were studied with emphasis to their postoperative outcome. Patients were broadly classified as having emergency or planned surgery. Patients undergoing emergency surgery were admitted under the care of a general surgeon and INR was monitored, if it was >2, they were given fresh frozen plasma (FFP) along with Vitamin K. Once the INR was <1.5,
There were 18 (42.9%) caesarean sections for pregnancies. Forty-two patients had non-cardiac surgery and had follow-up. Seven (1.4%) patients never came for follow-up and 12 (2.6%) patients were unable to obtain complete follow-up data on 61 (12%) patients. Five patients undergoing acute/emergency operations comprised of 4 females and a male. All female patients had mitral valve replacements. Three females underwent laparotomies, 2 for ectopic pregnancies and 1 for salpingectomy. One female underwent craniotomy for acute intracerebral bleed. One male patient having aortic valve replacement and diabetes mellitus underwent acute operation for carbunde. Nineteen patients had planned operations Table II.

Eighteen (42.9%) patients had caesarean sections and had live births with no postoperative thromboembolic complications. There was no episode of thromboembolism (TE) or postoperative bleeding in this series. Two patients had one transfusion each, one with intracranial bleed and one with spinal neuroblastoma. All patients in this study group were in the high risk group for TE due to large LA, AF or having a ball and cage valve.

At the end of study period, 2 (4.7%) out of 42 patients died, one of arrhythmia and the other of renal failure. The remaining 40 patients had 1300 visits at the author's outpatient clinic. The mean INR of these patients was 2.6 ± 0.47, maintained on a mean warfarin dose of 5.14 ± 1.3.

**DISCUSSION**

Cardiac surgery services are improving in Pakistan with an increase in number of centres and open heart surgeries performed regularly. More patients with mechanical valve prosthesis implanted for rheumatic valve disease will be seen over the next few years. This is a relatively young population on life-long anticoagulation and will require a non-cardiac surgical intervention at some stage. In the West, apart from anticoagulation for mechanical valve prosthesis, a large number of patients require anticoagulation for non-valvar atrial fibrillation and venous thromboembolism. The risk of withholding warfarin in patients with mechanical valve prosthesis and AF for thromboembolism is high. It has been reported to increase to 3.7 fold. Whereas Kearon et al

**Table 1:** Epidemiological characteristics of the study population.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total n=507</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age mean years</td>
<td>29.5 ±11.32</td>
</tr>
<tr>
<td>Male</td>
<td>292 (57.6%)</td>
</tr>
<tr>
<td>Female</td>
<td>215 (42.4%)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
</tr>
<tr>
<td>Isolated mitral valve disease</td>
<td>268 (52.8%)</td>
</tr>
<tr>
<td>Isolated aortic valve disease</td>
<td>76 (15%)</td>
</tr>
<tr>
<td>Aortic and mitral valve disease</td>
<td>96 (18.9%)</td>
</tr>
<tr>
<td>Mitral and tricuspid valve disease</td>
<td>46 (9.3%)</td>
</tr>
<tr>
<td>Aortic mitral and tricuspid valve disease</td>
<td>4 (0.8%)</td>
</tr>
<tr>
<td>Aortic valve with IHD</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Mitral valve with IHD</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Mitral and aortic valve disease with IHD</td>
<td>2 (0.4%)</td>
</tr>
<tr>
<td>Mitral and tricuspid valve disease with IHD</td>
<td>1 (0.2%)</td>
</tr>
<tr>
<td>Mitral valve with other associated lesions like ASD, PFO</td>
<td>9 (1.8%)</td>
</tr>
<tr>
<td>Prosthesis implanted</td>
<td></td>
</tr>
<tr>
<td>Ball and cage</td>
<td>345 (68%)</td>
</tr>
<tr>
<td>Single disc</td>
<td>38 (7.1%)</td>
</tr>
<tr>
<td>Bileaflet</td>
<td>120 (24.0%)</td>
</tr>
</tbody>
</table>

IHD= Ischemic Heart Disease; ASD= Atrial Septal Defect; PFO= Patent Foramen Ovale
have shown that of 10,000 patients with mechanical valves who are given intravenous heparin, 3 thromboembolic episodes are prevented at the risk of 300 major postoperative bleedings.8

Gohlke-Bärwolf et al.5 have shown that the risk of TE varies from 0-2% in AVR and 11-20% in MVR.5 Prendergast et al. have shown that the risk of TE for patients with prosthetic valve without anticoagulation is from 8-22% per annum and 0.02-0.06% per day.9 Withholding anticoagulation to a sub-therapeutic level has a theoretical risk of TE of 0.08-0.36%.9 This may be even higher depending on rhythm, type of prosthesis, LA size, LV function and previous history of TE.9

The occlusion of prosthetic valve has been reported to occur in 1-15% of cases.10 There is an approximately 4-8 per 100 patient-year rate of major thromboembolism in patients not receiving long-term anticoagulation therapy.11 Factors which predispose to an increased risk of thromboembolism include number of valves placed, type of valve implanted (greater in ball and cage variety), mitral valve replacement, atrial fibrillation, left atrial enlargement, LV dysfunction, clotting disorder and prior embolic event.12

In this study of 507 patients, 42 underwent non-cardiac surgical operations; 5 were emergency, 19 were planned operations and 18 were caesarean sections. This was a challenge as it involved a multidisciplinary approach in collaboration with another hospital surgical team. Larson et al.13 and Douketis et al.14 have described in their articles that there is no consensus regarding the management of perioperative anticoagulation in these patients.13,14 This is largely due to lack of clinical trials investigating different strategies.13 The most commonly used strategy is to admit the patient 3-4 days pre-operatively, discontinue their Warfarin monitor INR once below therapeutic range start IV UFH.13

This is stopped 3 hours before surgery. I/V UFH is restarted 6-12 hours after surgery along with oral warfarin therapy. The incidence for postoperative major bleeding has been reported as 10.9% with low molecular weight heparin (LWMH), 12.1% with UFH.13 There was no episode of thromboembolism, valve thrombosis or haemorrhage in this series. Heparin is continued till INR is in therapeutic range.

It has been reported by some that the risk of TE is exaggerated and IV heparin should only be used in patients with previous history of TE. A less aggressive approach is temporary discontinuation of warfarin and substituting it with subcutaneous UFH or LMWH. Authors do not agree with this as patients included in this study are at high risk of TE and anticoagulation was sub-therapeutic due to the reasons mentioned above.

Ansell et al.15 in their article have recommended that patients with a high risk of TE should withhold warfarin 4 days prior to surgery and allow the INR to fall below the therapeutic range and commence the patients on full dose heparin or LMWH and to stop this 3-6 hours before the surgery. In this study the INR levels was maintained on the lower therapeutic range (2-2.5) thus the admission 24-36 hours pre-operative is sufficient and in planned surgeries their warfarin dose was reduced a week before surgery. On admission, their INR was around 1.8-2.2; I/V UFH was started and warfarin was omitted, once INR was <1.5, they underwent surgery. Reduced pre-operative admission time was thus seen.

Authors agree with Gohlke-Bärwolf et al.5 that for major surgery, it is required to lower the INR to <1.5 and I/V UFH commenced once INR was <2 and APTT should be maintained at 1.5-2 times the control. Heparin is held 2-6 hours prior to surgery and to restart 6-12 hours postoperation with an aim to keep APTT 2 times normal. Warfarin is restarted 24 hours postoperatively or when patients can start oral intake. With this regime in this cohort, no postoperative hemorrhagic or thromboembolic complication was seen. Goldman et al.16 have reported a high risk of bleeding postoperatively and have stressed on lowering the INR to avoid hemorrhagic complications.16

In case of emergency surgery, the affect of warfarin needs to be neutralized by FFP, the dose of which depends upon the individual and this is titrated till INR was <1.5. In addition to this, vitamin K may also be given intravenously in small doses as large doses may lead to resistance to warfarin once, it is restarted following surgery.5

In patients who were pregnant and undergoing caesarean section, they were admitted and their warfarin was discontinued two weeks prior to the due date and they were commenced on I/V UFH and APTT was kept at 2-3 time the normal. The recommendations of European Society of Cardiology17 and American College of Cardiology12 for anticoagulation during pregnancy in patients with prosthetic valves to be opted after discussion with the patient and spouse.
Warfarin recommendations by American Heart Association and British Committee for Standards in Haematology have also emphasized optimization of anticoagulation therapy in patients of mechanical heart valves undergoing non-cardiac surgery.19-21

Authors agree with the recommendations given by Sridhar et al.4 and broadly follow that protocol. The only modification recommended is in planned surgery, the dose of warfarin can be tapered one week prior to the planned date of admission as discussed earlier.

CONCLUSION

Patients with mechanical valve prosthesis, on life-long anticoagulation, if managed properly, can undergo any type of non-cardiac surgical operation with minimal risk.

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