Current Evaluation of Penetrating Cardiac Injuries¶

PENETRAN KALP YARALANMALARINDA GÜNCEL DEĞERLENDİRME

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Summary

Background: We investigated the cases with intrapericardial injuries due to stabbing admitted to our clinic between January 1995 and August 2001 retrospectively.

Methods: There were totally 56 cases during this 6 years period. We performed echocardiography in 36% and chest X-ray in 64% of the patients. All patients were taken to operation as soon as possible, thoracotomy was performed and after pericardial decompression, surgical repair was completed.

Results: Injury localization rates were 46% for right ventricle, 39% for left ventricle, 7% for right atrium, 4% for right internal mammarian artery combined with pericard and 4% for only pericard. In two patients (4%) liver and in 26 patients (46%) lung injuries were associated with cardiac injury. We used tetanus and antibiotic prophylaxis in all patients. Our mortality rate was about 3.5%.

Conclusion: We suggested that with emergent physical examination and clinical experience, effective therapy protocol and emergent operation must be performed in the patients with known stab injury localization and with thoracal penetrance and this approach is the first rule to decrease morbidity and mortality.

Key Words: Intrapericardial stab wounds, Cardiac tamponade, Cardiopulmonary resuscitation, Emergent thoracotomy

T Klin J Cardiovascular Surgery 2003, 4:121-125

Özet

Amaç: Ocak.1995-Ağustos. 2001 tarihleri arasında bıçaklanma sonucu oluşan intraperikardiyal ulaşımlı yaralanma neticesinde kliniğimize başvuran olgular retrospektif olarak incelenmiştir.

Yöntem: Bu altı yıllık peryoddaki toplam olgu sayısı 56 idi. Hastaların %64'ünde göğüs radyografisi ve %36'sında ekokardiyografik incelemeler gerçekleştirildi. Hastaların tümü olabildiğince en kısa sürede operasyon salonuna alınarak torakotomi uygulanmış ve perikardiyal dekompresyon sonrası cerrahi onarımları tamamlanmıştı.

Bulgular: Yaralanma lokalizasyonu olarak sağ ventrikül %46 sol ventrikül %39, sağ atrium %7, sağ internal mammarian arter ile kombine perikard yaralanması %4 ve sadece perikardla sınırlı yaralanma da %4 oranında saptanmıştı. İki hastada (%4) karaciğer ve 26 hastada (%46) akciğer yaralanması, kardiyak yaralanmaya eşlik ediyordu. Tüm hastalarımıza tetanoz ve antibiyotik profilaksisi uygulanmıştı. Mortalite oranımız %3.5 olarak gerçekleşmişti.

Sonuç: Toraksa penetre bıçak yaralanmasının lokalizasyonunun belirlenmiş olması sonucunda acil fizik bakı ve klinik tecrübe göz önüne alınarak etkin tedavi protokolünün gerçekleştirimini ve acilen operasyona alınması yaklaşımının morbidite ve mortalitenin bu hastalarda azaltılmasındaki birincil koşul olduğu görüşündeyiz.

Anahtar Kelimeler: Perikarda ulaşımlı bıçak yaralanmaları, Kardiyak tamponad, Kardiyopulmoner canlandırma, Acil torakotomi

T Klin Kalp Damar Cerrahisi 2003, 4:121-125

Importance of emergent therapy in intrapericardial extended injuries is originated from, prevention of cardiac tamponade, shock, external hemorrhagy and processes causing exitus. Our therapy protocol for the patients admitted to our emergency service with stab injuries extended to intrapericardium prodiagnosis was; emergent stabilization of vital signs, controlling the external hemorrhagy, performing radiologic and echocardiographic tests due to patients general status and getting the patient to operation room rapidly, respectively. The purpose of this study is to determine whether the

morbidity and mortality rate is acceptable with this therapy protocol and to transport our experiences about this.

Material and Method

We evaluated 56 patients with stab injuries extending to intrapericardium retrospectively between January 1995 and August 2001. We determined patients' age, gender, alcool consumption, social position, month of the injury, period between the injury and admittance to hospital, physical findings and hemodynamic parameters during initial examination, radiologic and echocardiographic evaluation results if any and type of operation and following complications, mortality rate and hospital stay.

Operation and Strategy

Initially we talk an anamnesis about stab injury extending to intrapericardium. Physical examination was performed in emergency service to all suspicious cases and aimed to maintain the cardiac output, determine the open chest injury with evaluating hemo an pneumothorax. Determining the entrance way in penetrating injury is very important for the surgeon to suspect from intrapericardial injury early. If necessary oxygen inhalation was performed and for assisted ventilation, intubation was performed. Peripheric and central venous catheterization and urethral catheters were performed routinely. Consistent with the stability of the patients, vital signs, electrocardiography, chest X-ray and echocardiography were performed. If there was serious pneumothorax and/or hemothorax with clinical (dyspnea, hypotension) and radiological findings, emergent tube thoracostomy was performed. Indications for emergent operations were cardiac tamponade, associated shock, external hemorrhagy, and shock and hemorrhagic combinations. Patients with unstabil vital signs and showing clinical, radiological and echocardiographical cardiac tamponade signs were operated emergently (Table 1).

Thoracotomy was performed due to injury localization and then pericardium was opened largely. Coagulum materials was cleaned for exploration and injury localization was determined. Then its depth and length was determined. Generally hemorrhagy was controlled with digital compression. Simple myocardial injuries were repaired primarily with teflon-felt or prolene sutures streng then with pericardium and avoided from myocardial tear. Distal branches of injured coronary arteries can be ligated. We didn't need cardiopulmonary bypass during primary repair operations of our cases. Of the 56 cases, 4 were women and 52 were men. Their ages were between 16 and 51 years and average 29 years. Income level was low in injured patients. 12 of 56 cases were drinker (21%). Injury rates was higher in april and may (50%). Average period between injury place and admittance to our emergency service was 36 minutes (ranged between 25-65 min.)

Table 1. Preoperative teleradiographic and echocardiographic investigations and findings.

Total patient number	56	
Teleradiography	38	64%
Echocardiography	20	36%
Hemothrox+tamponade	26	46%
Hemopneumothorax+tamponade	28	50%
Tamponade	2	4%

We couldn't determine tension and heart rate in 12 patients during admission. 10 of them responded cardiopulmonary resuscitation (CPR) and fluid therapy and taken to operation immediately. Average period between admission and beginning of operation was 20 minutes. Two patients didn't respond external and internal CPR. These patients had left ventricle and lung injuries and left anterolateral thoracotomy was performed. They died. According to injury localization and to reach the expected region of heart we performed right anterolateral thoracotomy in these two patients and they had right ventricular injury. In the patients and they had right ventricular injury. In the other 8 patients we performed left anterolateral thoracotomy. In one patient with LV injury there was also diagonal artery injury and it was sutured primarily.

In 6 of these 12 patients there was also lung injury associated with LV injury and they repaired

with primary sutures. Six of 12 patients had hemothorax+tamponade and the other 6 had hemopneumothorax + tamponade (50%). Hypoxic encephalopathy was developed in 6 of 12 patients and postoperatively 4 became normal and their brain computed tomography results were normal. In the other 2 patients permanent quadrispasticity was developed and they could only respond to simple orders. Postop chest X-ray and echocardiography results were normal in these 10 patients.

Heart rate was filiformic and systolic blood pressure was under 80mmHg in 42 patients. Six of them didn't respond volume replacement and their TA was under 40 mmHg so they emergently operated with cardiopulmonary resuscitation. Others responded the volume replacement. Only in 36 of 42 patients (86%) teleradiography could be taken. Echocardiography was added to teleradiography in 18 patients (43%). In 20 there was hemopneumothorax + tamponade, in 22 hemothorax+tamponade determined. Also they were operated emergently. We performed left anterolateral thoracotomy to 38 patients and right anterolateral thoracotomy to 4 patients (Table 2). In the 2 patients with right anterolateral thoracotomy there were RV and liver injuries. Liver injury was repaired primarily. Postoperative chest X-ray and echocardiographic evaluations were in normal limits. There were right ventricle injury 22 patients, left ventricle injury in 14 and right atrium injury in 4 patients (Table 3). In two patients with right anterolateral thoracotomy there was RIMA+pericardial injury and right internal mammary artery were ligated. Four patients, in whom tube thoracostomy was performed, were patients transported from other hospitals after initial processes due to continuing hemorrhagy and lowered TA under 80mmHg. In two of them left ventricle + left lung and in the other two right ventricle + left lung injuries were determined. One patient was reoperated after 32 days of the operation due to lung atelectasis and extended fluid collection in right hemithorax and after decollection of 800cc defibrinated blood, we performed decortication. Other patients' postoperative chest X-ray and echocardiographic evaluations were normal.

Table 2. Operative approach strategies

Left anterolateral thoracotomy	44	75%
Right anterolateral thoracotomy	6	14%
Right anterolateral thoracotomy+ laparatomy	2	3.5%
Left anterolateral thoracotomy+tube thoracostomy	4	7.5%

Table 3. Anatomic localization of the injury and prevalence

Right ventricle	26	46%
Left ventricle	22	39%
Right atrium	4	7%
Right internal mammarian artery+ pericard	2	4%
Only localized to pericard	2	4%
Associated lung injury	26	46%
Associated liver injury	2	4%

General conditions of two patients were stabil. There wasn't hemothorax or pneumothorax in chest X-ray. Echocardiographic evaluation due to precordial localization of the injury showed pericardial fluid and central venous pressure was over 12 mmHg so left anterolateral thoracotomy was performed because of cardiac injury suspicion and limited injury was found on pericardium.

Briefly, due to injury region's localization and to reach the probable heart injury region, in 48 of 56 operated patients we performed left anterolateral thoracotomy and in 8 right anterolateral thoracotomy (Table 2). We found right ventricle injury in 26 (46%), left ventricle injury in 22 (39%), right atrial injury in 4 (7%), right internal mammary artery + pericard injury in 2(4%), and pericard injury in 2 (4%) patients. The most prevalent secondary organal injury was related with lung. The second prevalent injury was liver injury and was seen in two patients (Table 3). There was hemothorax+tamponade (46%) in 26, hemopneumothorax+tamponade in 28 (50%), tamponade in 2 (4%) of 56 patients. In 6 of 56 patients hypoxic encephalopathy developed and 4 returned to normal with normal postoperative cerebral computed tomography. However in two patients permament quadrispasticity occurred and they only obey the simple orders. One patient was reoperated on 32nd post-

operative day for right hemothorax+atelectasis and after removing 800 cc defibrinated blood, we performed decortication. In all patients we used triple parenteral antibiotherapy prophylaxis and postoperative follow-up period was between 4 and 10 days (average 6 days). Two patients with permanent quadrispasticity transferred to Physic treatment and rehabilitation clinic.

Discussion

We operated 56 patients with stab injuries extending to intrapericardium between January 1995-August 2001. Our mortality rate was about 3.5%. Mortality rate was 0.0% for two patients with intraabdominal organ, lung and right ventricle injury so mortality percent wasn't effected. Our low mortality rate was consistent with earlier literature and this was effected with good transport system to hospital, emergent medical approach and performing early operation (1,2). Thorax radiography, echocardiography and pericardiosynthesis are not so reliable to determine the acute intrapericardial extended injury. Due to misdiagnosis, general status can be distracted in stabil patients and even exitus can be seen (3). In 64% of the patients teleradiography and in 36% echocardiography was performed.

Cardiac tamponade can become fatal in minutes. Decreasing cardiac output and following shock table develop because of depressed myocardial contractility and insufficient, atrial contractility (4,5). In this condition widespread reflex compansation mechanisms, peripheric arterial and venous vasoconstruction and prevention of intravascular volume, and increased chronotropism maintain the cardiovasculary stability. General anesthesia can inhibate these reflexes and cardiac arrest can develop. Successful results has three basic elements an these are; replacing the blood volume, control of hemorrhagy and emergently removing the tamponade. Our protocol in 56 patients series was to operate the unstabil patients emergently and to stop hemorrhagy and remove the tamponade. Primary element in diagnosis is to suspect injuries with cardiac extension in all injuries located precordially (5,6). In 60% of all stab injuries in parasternal and precordial localizations, we found cardiac laseration. In the patients with injuries extending to heart, stab injuries located at parasternal or precordially was 85%(4). In hypotensive patients emergent thoracotomy must follow rapid resuscitation. In contrary, relatively stabil patients can be operated after diagnostic tests. Hemodinamically stabil patients with penetrating thoracal trauma were evaluated with echocardiography for cardiac injury's differential diagnosis. Echocardiography is a reliable technique for diagnosis and also has the advantage of diagnosing in early period (9,10). In another study, it was shown that echocardiographic evaluation was more safe, reliable, sensitive and specific in the cases without hemothorax and its reliability decreases in the patients with hemothorax table (11). In our series in 36% of the preoperative patients echocardigraphic evolution was made (Table 1). We determined the echocardiography cases due to clinical criterion of clasification at first admission to emergency service. According to first evaluation, 2 cases with stabil general states and 18 cases with blood pressure ≤80mm Hg and conscious were underwent transthoracic echocardiography before emergent intervention. With these 20 cases our rate was reached to 36%. Most prevalent injury locations were right ventricle (46%) and left ventricle (39%) in the patients we operated (Table 3). This prevalence rate is consistent with many studies results (2,8,12,13).

As a conclusion we found that approach must be systematic in the patients with stab injuries penetrated to thorax. Because comorbidities associated with intrapericardial extended injuries can be missed and its therapy can be delayed.

The patients with bad general conditions and not convenient for laboratory and radiological evaluations, immediately operated according to physical examination and clinical experience if injury localization was determined (1,2,3,14. We suggested that the primary principle is this approach to decrease the morbidity and mortality.

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Geliş Tarihi: 13.11.2002

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