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COMPARTMENT SYNDROME AND ITS TREATMENT IN ARTERIAL TRAUMA

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ABSTRACT:

Introduction: In each case with important peripheral vascular injury one of the crucial problems to be solved is the installation of the compartment syndrome.

Material and methods: From August 1999 till March 2005 we treated 77 patients with important arterial injuries of the limbs. The range in age was from 13 to 65 years old. In 62 patients the injury was in lower limbs, in 15 the injury was in upper ones. The injuries were casualties of shotguns in 55 cases, knives and other sharp objects in 17 cases, road incidents in 4 cases and iatrogenic 2 cases.

We performed fasciotomy in 29 cases. All of them in the legs. In the cases we performed fasciotomy complexity of trauma was 93%. The rest of cases had a complexity of 15 %. Mean time of addition in our department from the moment of trauma was 16.5 hours in fasciotomy group and 6.5 hours in non fasciotomy group.

In the cases with fasciotomy revascularization procedures have been performed in 85% of patients. Whereas in the cases without fasciotomy revascularization procedures were performed in 100 % of cases.

Results: In the cases treated with fasciotomy 26 patients did well versus 32 in non fasciotomy group. Amputation in different levels were performed in three cases in fasciotomy group and one in the other group. Neuropathy was installed in 2 patients with fasciotomy versus 1 patient without fasciotomy. Muscular necrosis suffered 3 patients with fasciotomy. Mean duration of stay in hospital was 19 days in the group with fasciotomy and 10 days in the group without.

Conclusions: Fasciotomy should be performed as soon as possible in all cases where a compartment syndrome is installed.

Introduction:

Trauma is one of major causes of death in our hospital. The patients generally belong the age till fourth decade of life . They had penetrated and blunt vascular trauma injuries. In developed countries the causes of injury usually are road accidents and invasive diagnostic and therapeutic procedures [20,21,22] .

In our hospital in 92 % of patients the injury is been due to aggression of the person ; 5 % are due to road accidents and 3 % iatrogenic ones . Most of the patients have been injured by military weapons , which have high kinetic energy causing massive damage of tissues [17,18,19] . In all cases that a major vascular injury is present the surgical team should be alert of compartment syndrome [2,3,11] .

Material and Methods:

We studied 77 patients with vascular limb injuries during August 1999 – March 2005 .In the study are included patients with major vascular injuries of the limbs and are excluded those with not important vascular injuries . In other words those with injuries that do not threaten the limb viability .

In our cases 72 were males , 5 females . The age of patients rated 13 - 65 years old [medium 28,9 years old] . In 62 patients the injury is been in inferior limbs and 15 in superior ones .

The cause of injury was [Graphic 1]:

- a - 54 cases by shot guns.
- b - 17 cases by sharp weapons.
- c - 4 cases by road accidents.
- d - 2 cases iatrogenic injuries.

We performed fasciotomy in 29 cases. All of them be-

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Fasciotomy Technique



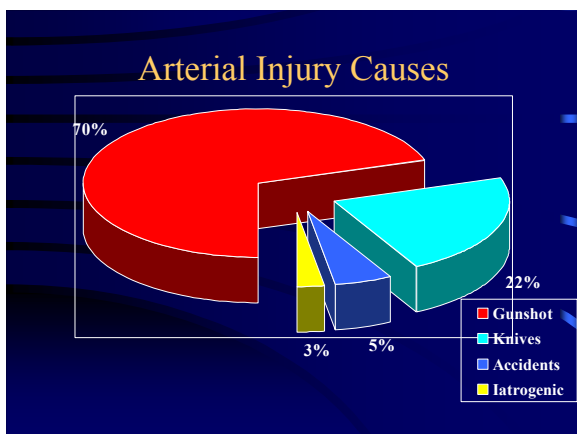
long to inferior limbs. Fasciotomy was done when compartment syndrome was installed [1, 3,4]. 33 patients were treated without fasciotomy[8] , 5 of them were complex trauma.

In the cases where fasciotomy was done the injury belonged to the artery alone [2 cases] ; artery and vein [20 cases] ; vascular injury and fracture [7 cases] .

Results and Complications

	No fasciotomy	With fasciotomy
Positive Result	32 (96,96 %)	26 (89,65 %)
Amputation	1 (3,04 %)	3 (10,34 %)
Neuropathy	1 (3,04 %)	2 (2,5 %)
Tissue Necrosis	0	3 (3,7 %)

$p > 0,05$
No significance



GRAPHIC 1

The study has a retrospective analytic character .We compared:

- 1 – The final result.
- 2 – Complications.
- 3 – Complexity.
- 4 – Duration of stay in hospital.

The statistical test used is of Mann – Whitney.

Results:

An important component in vascular trauma is the complexity of injury [15,16] . In 38 , 9 % of our cases the injury belonged the arterial system . In 61, 1 % there was combined injuries. From them 72 , 3 % was injured the arterial and venous systems . In 21, 3 % there was an artery and a bone fracture. In 6 , 4 % the injury belonged to arterial and muscle –skeletal systems [See graphic 2] .

If we will evaluate cases treated with and without fasciotomy we ' ll see that cases treated with fasciotomy stayed longer in hospital than those treated without. From the other side if will compare the arrival hospital time , the complexity of injury and the kind of surgical procedure performed , the definition will come that in cases treated with fasciotomy were more complex , they reached late in the trained medical centre and in 85 % of revascularization surgical intervention was performed [See Graphic 2] .

In the cases where fasciotomy is been done our surgical choice was lateral and medial fasciotomy with long incisions [9,10,11] [See Figures 1 and 2] .

In the table 1 there are indicated results in both groups . With not favorable result we considered each case were any kind of amputation was performed .

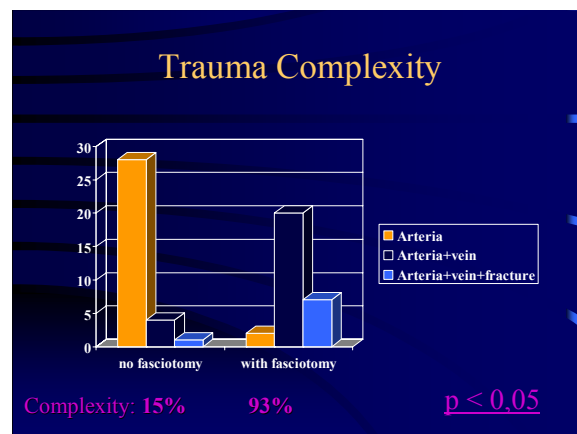
In all cases with a muscle necrosis , the first signs of ischemia and necrosis appeared in the anterior muscle compartment of lower limbs . In one of the amputated case the revascularization procedure was done 14 hours after the event . In other 3 cases the amputation is performed after fasciotomy was done . Fasciotomy closure was done in a period of time varied 5 - 40 days . This happened due to degree of infection and muscle necrosis .

The median hospital stay for patients treated with fasciotomy was 19 days . In the other group the median hospital stay was 10 days .

Discussion:

We used Mann - Whitney statistical test. Based on the test there was a significant difference [$p < 0.05$] belonging the complexity of trauma in the fasciotomy and without fasciotomy groups .

There by the amputation rate in the fasciotomy group should have been statistically significant . In fact it resulted that the amputation rate between both groups was comparable .



GRAPHIC 2

Also significant difference was between groups belonging duration of stay in hospital . We saw that in the amputated cases there were complex injuries , the arrival time in hospital was late [20 - 36 hours] , surgical procedure was ligature of the artery .

In the results optic we think that fasciotomy is very important in the cases where it is indicated , independently from the fact it usually is followed by longer hospital stay [12,13,14] .

According to muscle necrosis and neuropathy we believe that they are not complications of fasciotomy procedure , but results of delay in performing fasciotomy.

Conclusions:

1 – Fasciotomy is as well important as the revascularization procedure is , making it more effective and reducing sequels of compartment syndrome .

2 - Time , complexity and anatomic region that a peripheral arterial trauma is associated , are important predictor factors in the development of compartment syndrome .

3 - When compartment syndrome is installed long incisions should be done .

4 - The possibility of development of compartment syndrome in upper limbs is less than in the inferior ones.

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Ю.Б.Серебрянский, И.Н.Староверов, Е.Н.Бырихин, Н.А. Ларионов ВОЗМОЖНОСТИ ЛЕЧЕНИЯ ИШЕМИЧЕСКОЙ ФОРМЫ ВЕНОЗНОГО ТРОМБОЗА В СОВРЕМЕННЫХ УСЛОВИЯХ

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Реферат:

Представлен опыт лечения 15 пациентов с ишемической формой острого тромбоза глубоких вен конечностей. Рассмотрены: этиология, клиника, варианты лечения венозной гангрены. Рекомендована активная хирургическая тактика в лечении этой группы пациентов.

Ключевые слова: тромбоз глубоких вен, венозная гангрена, клиника, хирургическое лечение.

Прошло более 70 лет с момента определения понятия phlegmasia cerulea dolens (Gregoire 1938), но лечение этого тяжёлого состояния остаётся крайне серьёзной проблемой. За последние 10 лет в доступных нам зарубежных источниках представлено 12 сообщений о ишемической форме венозного тромбоза.

Представлен суммарный опыт лечения 24 пациентов. Лишь в одном сообщении обсуждается результат лечения 14 пациентов с венозной гангреной нижних конечностей, тогда как в остальных – только единичные случаи. В публикациях посвящённых этой проблеме, среди основных причин развития ишемической формы венозного тромбоза у пациентов второй половины жизни рассматриваются злокачественные новообразования и гепарининдуцированные тромбоцитопении в условиях применения варфарина и выраженного дефицита естественных антикоагулянтов (протеина С).

У пациентов первой половины жизни основным этиологическим фактором являются тромбофилии. В одном случае этиологическим фактором явился дефицит S-протеина в сочетании с экстравазальной компрессией подвздошной вены увеличенной маткой при беременности. В сообщении, посвящённом проблеме ТЭЛА при раковой интоксикации, рекомендуется определение повышенного серологического антикардиолипидного уровня в качестве предвестника возникновения синей флегмазии и тромбоэмболического события. Ещё в одном случае было отмечено, что применение варфарина у пациента с метастатическим раком легкого и тромбозом глубоких вен привело к тяжёлому истощению белка С и развитию синей флегмазии.

В другом случае причиной развития венозной ишемии нижней конечности явилась катетеризация бедренной вены при лечении острой пневмонии. Казуистическим случаем можно назвать сообщение о возникновении синей флегмазии у пациентки 49 лет после операции по замене аортального клапана при врожденном эндокардите клапана. Антифосфолипидный синдром или дефекты в системе естественных антикоагулянтов клинически проявляются развитием венозного тромбоза на фоне заболевания, операции или беременности.

Первым этапом лечения является комплекс консервативных мероприятий, учитывающий причины тромбоза. Усиление симптомов острой венозной недостаточности с появлением ишемических изменений в дистальных отделах конечности диктует необходимость применения фибринолитической терапии, эндоваскулярных вмешательств и крайне редко венозной тромбэктомии. Однако, результаты лечения этой тяжелой патологии остаются неудовлетворительными. У 4 из 5 пациентов явления синей флегмазии приводят к развитию гангрены конечности и ампутации конечности. Смертность в этих случаях достигает 70%.

В доступных нам сообщениях не представлены ясные клинико-диагностические критерии перехода от консервативной терапии к хирургическим методам лечения. Это побудило нас представить собственный опыт лечения 15 пациентов с тяжёлой формой острой венозной недостаточности. В исследование включены 15 пациентов с phlegmasia cerulea dolens, в том числе в одном случае на левой верхней конечности. Среди пациентов мужчин было 8, женщин – 7. Возраст от 24 до 64 лет, в среднем – 41 год. Причинами тромбоза были: хроническая венозная недостаточность – 5; фибромиома матки-1; злокачественные новообразования - 3; не выявлена -5, гнойная инфекция руки с отёчным синдромом -

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