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PERCUTANEOUS FASCIOTOMY IN IMPENDING COMPARTMENT SYNDROME-A PROSPECTIVE STUDY OF 25 PATIENT

KEYWORDS: compartment,fasciotomy

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ABSTRACT **BACKGROUND** Compartment syndrome present a challenge for orthopedic surgeons. It is an emergency surgical condition that can lead toprofound functional disability ,ischemia and gangrene, if not diagnosed& treated promptly. We performed a prospective study of post traumatic impending compartment syndrome treated by mini open compartment fasciotomy. Results in terms of wound complication,need for secondary procedure, timing of fracture fixation, rate of fracture union, hospital stay and cosmetic appearance were evaluated against complete open fasciotomy.

MATERIALS AND METHODS Twenty five patients who were operated between 2010 and 2016 were selected for the study. 24 patient with fracture tibia treated with fasciotomy followed by definitive fixation. One patient of wringing injury by rope with impending compartment syndrome. All documents from their admission until the last follow-up in December 2016 were reviewed, data regarding complications collected and results were evaluated using Oxford Knee scoring system ,Lower Extremity Functional Scale, union rate, complication,Circumferential measurements and range of motion.**RESULTS** Need for secondary wound procedure(flap.SSG,VAC) is nil. Definitive management of fracture done early with high union rate, lesscomplication, less hospital stay with good cosmetic results.**CONCLUSION** ➢ This study shows importance & methods of detecting a specific condition **'Impending compartment syndrome'**& limited intervention during this period will prevent a full fledged compartment syndrome & subsequent permanent disability.
➢ Similar studies are very rare in the literature.

INTRODUCTION

➢Compartment syndrome is an orthopedic emergency. Approximately 40%of all compartment syndromes occur after fractures of the tibial shaft[1].The classical clinical features of five Ps (pain,pallor, paralysis, paresthesia, pulse-lessness) cannot be always relied upon for early diagnosis of a developing acute compartment syndrome[2].Early diagnosis and treatment are of the utmost importance in order to avoid long-term disability[3].

➢Younger patients are more prone to get ACS as compared toelderly patients with the same nature of trauma[4].

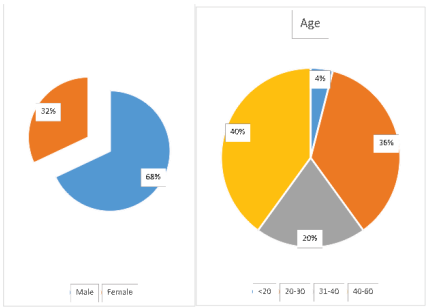
➢Males are more prone to develop ACS which is ten times higher than females.

MATERIAL AND METHODS

Type of study: Prospective Study
Study Setting: Govt. T.D. MCH Vandanam

➢We studied 24 patients with closed fractures and one of wringing injury leg by rope between 2010 and 2016. Only those patients presenting within six hours of injury were included in the study. Informed consent was taken from each individual patient.

➢There were 17 *male* and 8 f*emale (fig.1)* patients with the majority in the age group of 15-50 years , the mean age being 35.32 years.



➢15 patients with tibial platue fracture,8 patients with fracture tibial shaft,1 with type 2 epiphyseal injury proximal tibia and one with wringing injury by rope .

➢19 patient having right side involved , 6 having left side involved.

➢All the patients were evaluated for the presence of any associated life-threatening emergency and as such resuscitation was carried out for these patients.

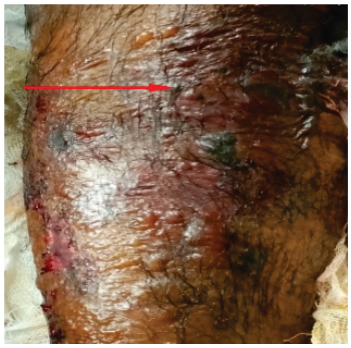
➢A careful physical examination was carried out to look for the clinical features of compartment syndrome including pain out of proportion with firmness of the compartment, pain on passive stretching of the involved muscles as well as paralysis, paresthesia and pulse -lessness.

➢Sole criteria for diagnosis was **clinical**[5,6](specificity and negative predictive value were each 97% to 98%)7

➢The limb elevation was provided with the help of **Bohler-Braun** splint. Serial clinical examinations were done to identify the signs of impending compartment syndrome. Patients were operated within 6 hours of appearance of symptoms.

➢Antibiotic prophylaxis (intravenous cefuroxime 1.5 g) was administered and it was continued twice daily byintravascular route for 5 days .

➢Oxygen saturation checked with pulse oximeter.



Patient with tibial platue fracture(type 6) showing skin blebs as sign of increased compartment pressure.
Figure 3

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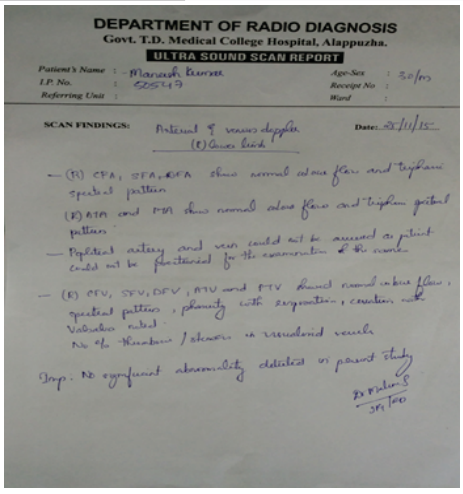

DEPARTMENT OF RADIO DIAGNOSIS
Govt. T.D. Medical College Hospital, Alappuzha.
ULTRA SOUND SCAN REPORT

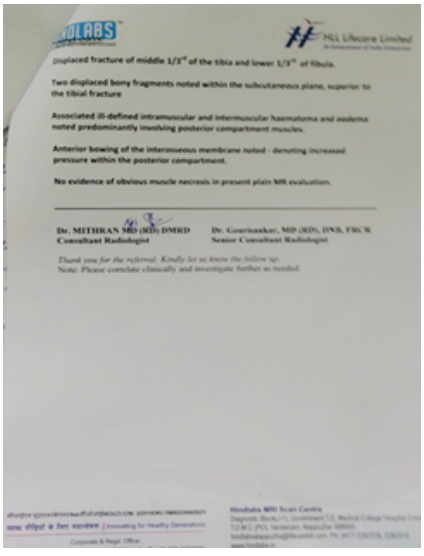
Patient's Name : Manesh kumar
I.P. No. : 52549
Referring Unit :
Age-Sex : 30/m
Receipt No :
Ward :

SCAN FINDINGS: Arterial & venous doppler (R) Lower limb
Date: 8/11/15

— (R) CFA, SFA, PFA shows normal triple flow and triphasic spectral pattern
(R) ATA and PTA shows normal triple flow and triphasic spectral pattern
— Popliteal artery and vein could not be assessed as patient could not be positioned for the examination of the same
— (R) CFV, SFV, DFV, ATV and PTV showed normal triple flow, spectral pattern, phasicity with respiration, cessation with Valsalva noted.
No obstruction / stenosis in visualized vessels

Imp: No significant abnormality detected in present study

Patient with impending compartment syndrome with normal Doppler findings.
Figure 4


Displaced fracture of middle 1/3rd of the tibia and lower 1/3rd of fibula.

Two displaced bony fragments noted within the subcutaneous plane, superior to the tibial fracture

Associated ill-defined intramuscular and intermuscular haematoma and oedema noted predominantly involving posterior compartment muscles.

Anterior bowing of the interosseous membrane noted - denoting increased pressure within the posterior compartment.

No evidence of obvious muscle necrosis in present plain MR evaluation.

Dr. MITHRAN MD (RD) DMRD
Consultant Radiologist

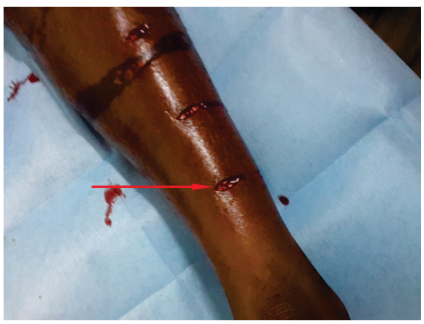
Dr. Gouriankar, MD (RD), DNB, FICR
Senior Consultant Radiologist

MRI Of patient with impending compartment syndrome showing evidence of increased compartment pressure.

PROCEDURE
FOR ANTERIOR COMPARTMENT
2 to 3cm transverse incision lateral to shin
First at 2 inch bellow tibial tuberosity.
Second at 2 inch above ankle joint
One or two incision in between.

Figure 5
Picture showing incision for anterior compartment release.

Retract skin, identify and palpate *white* tense deep fascia



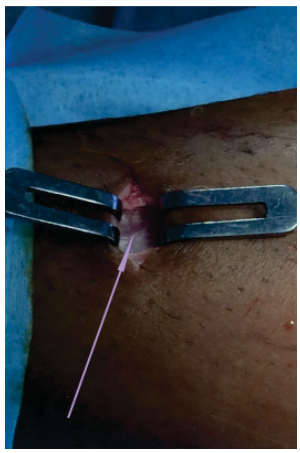


Figure 6
Arrow showing white tense deep fascia.(fig.6)

Make a transverse cut in the deep fascia.

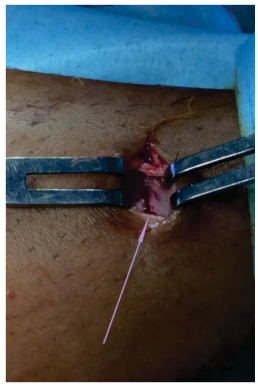


Figure 7
Picture showingtransverse cut in the deep fascia.(fig.7)

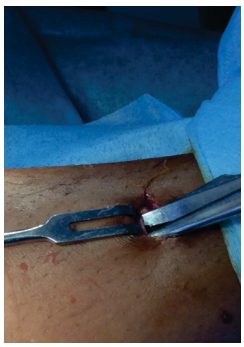


Figure 8
Pass *halfopen* scissor with edge of fascia between blades and advance

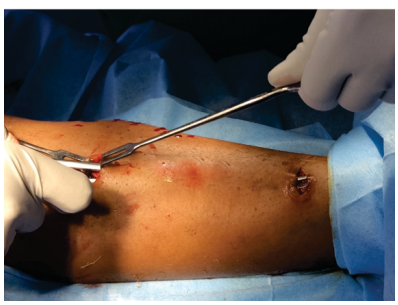


Figure 9
Arrow showing tip of scissor passed from one incision to other.(fig.9) to next incision.

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Cut the fascia till scissor comes out through second incision.
The next incision repeat same procedure till reach up to the ankle joint.

POSTERIOR COMPARTMENT

A 2cm Incision at One inch behind posterior margin of tibia
Same technique to release superficial compartment
With fingers passing through the posterior border of tibia reach the deep compartment ,if tense we can incise that also.
Soleus insertion should be released to adequately decompress the posterior compartment
Surgeons should be careful about superficial peroneal-nerve which comes across around 10-12 cm proximal to the lateral malleolus while exiting from the fascia.

LATERAL COMPARTMENT

➢2 cm 3to 4 incision over fibula 5cm below head of fibula and 5cm above the ankle joint.
➢Same technique followed to incise fascia.

➢Skin sutured with subcuticular (fig.10)method for best cosmetic result.
➢Oxygen saturation measured with pulse oximeter.
➢Limb elevated over ***Bohler-Braun*** splint.

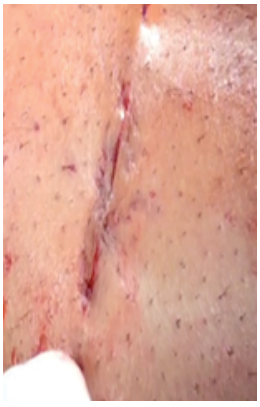


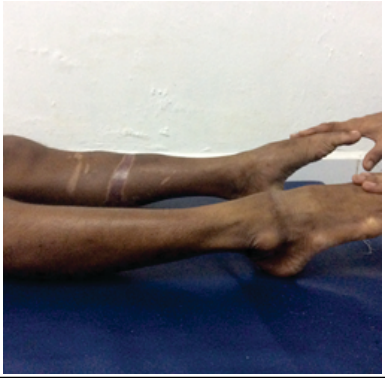
Figure 10
Subcuticular suturing

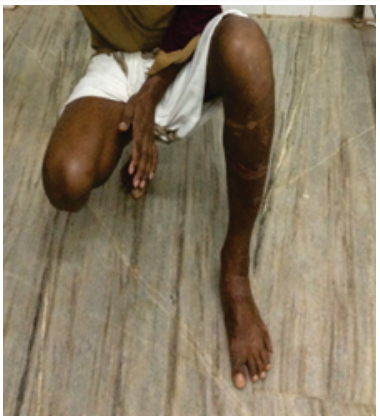
POST-OP PROTOCOL

➢Patient evaluated for compartment syndrome after12 hrs. of fasciotomy with stretch-pain,pulse,oxygen, saturation, circumference of calf compared to normal fellow limb.

➢10 days post op patient treated with definitive fixation for fracture .

➢Static quadriceps exercises and non-weight bearing knee mobilization were started as soon as patient became pain-free.





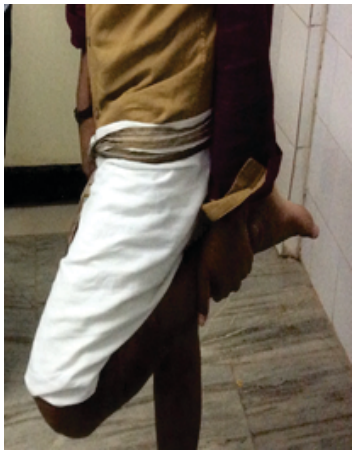


Figure 11
Post-op patient with full range of movement.

➢All patients were followed up at regular intervals for at least 18 months. During the follow-up period, fracture healing time and post-operative complications were recorded.

RESULTS

➢In our study its found that there is decrease in swelling of average of 40% in circumference ,with obvious relaxation of compartment.

➢Oxygen saturation increased by approximately 7 percent.

➢No patient required secondary procedure for soft tissue management.

➢No post op skin necrosis or infection noted.

➢No neurological injury noted.(one patient developed saphenous neuropraxia which fully recovered in14 days)

➢All fractures united.(Reverte et al. mentioned significantly high incident of delayed union or nonunion of tibial shaft fractures with compartment syndromes9.They reported 55% nonunion or delayed union in ACS versus 17.8% in fractures without ACS in a meta-analysis study.)

➢Hospital stay is reduce by 2 week as no secondary procedure required. (NPWT reduces the risk of infection but it ends up with high chance of skin grafting[10].

CONCLUSION

➢ This study shows importance &methods of detecting a specific condition ***'Impending compartment syndrome'*** & limited intervention during this period will prevent a full fledged compartment syndrome & subsequent permanent disability.

➢ Similar studies are very rare in the literature.

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