CHAPTER THREE

RESULTS

Clinical, Radiographical and histological Findings

Clinical examinations and the follow up of the general condition of the operated animals were made to evaluate recovery and bone healing (table 2).All operated animals were followed until the clinical and radiological .healing is satisfactory

Body temperature, Pulse Rate and Respiratory Rate were in reference (values. (Table 3

The partial weight bearing by operated limb was obtained in 7 ± 3 post-operative days and the complete weight bearing was recorded in 28 ± 3 post-operative days.

Histology slides of Bone marrow showing the typical cellular masses of .developing blood cells lying between the rounds, empty fat cells

Bone marrow smear revealing normal iron stores using Prussian blue stain. Normal iron stores are seen as dark blue stained material .in the bone marrow

The hematological values obtained in this study were in reference range Table4) and comparable to those previously reported concerning the) .(values of Sudanese goats (Azab and Abdel-maksoud, 1999

Table 2: Clinical and radiographical Findings

Case no	Clinical Findings	Radiographical Findings
1	The animal stood on day 5, and walked on the .19th day after operation	X-ray image after 6 months of the operation showed the full absorption of the splint bone
2	The animal stood on day 7, and walked at 15th .day after operation	After 8 weeks callus formation ((secondary callus)) started to cover the distal and proximal segments of the Femur
3	.The animal stood on day 9 after operation	After 10 weeks callus formation ((secondary callus)) started to cover the distal and proximal segments of the Femur
4	The animal stood on day 7, and walked on day .27th after operation	X- Ray image after 12days showed good healing ,proper alignment and beginning of .the bony pin absorption
5	The animal was able to put its weight on the affected limb on the 5th day post operation and stood on his operated limb on the day 13 after .operation	X- Ray image after 15 weeks showed proper alignment and good healing with partial .absorption of the bony pin splint
6	The animal stood on its operated limb on day 8 after operation and walked on the 29th day .without any complications	second X-Ray was taken 6weeks after operation and showed dense, strong (good) callus and proper alignment
7	The animal stood on its operated limb on day 6 after operation and Walked at the 27th day after operation. No .complications appeared	After 8 weeks callus formation ((secondary callus)) started to cover the distal and proximal segments of the Femur with proper alignment
8	Animal stood on its operated limb on the 8th day .after operation	Radiograph was taken after 9 weeks showed good callus ((secondary callus)) that covered the distal and proximal segments of the Femur
9	The animal stood on its operated Limb on day 6 after operation and Walked at the 29th day after operation. No .complications appeared	After 6 weeks x-ray showed strong callus((secondary)) and proper healing
10	Animal stood on its operated limb on the 5th day after operation .At day 25 after operation the .animal walked	X- Ray taken 12 months after operation showed complete absorption of the bony pin with very good healing
11	The animal stood on its operated leg on day 10	X- Ray was taken 8 weeks after operation

	after operation andWalked at the 26th day after operation	and showed dense and good callus. Site of the fracture hardly seen
12	The animal stood on its operated limb on day 7 .andWalked at the 25th day after operation	After 8 months the x-ray showed complete absorption of the bony pin

.Table 3: Body temperature, Pulse and Respiratory values

	Case no												
Parameters	1	2	3	4	5	6	7	8	9	10	11	12	Reference* values
Body temp	102 -/+ 0.5	102.5 0.5-/+	102.8 0.5-/+	102 -/+ 0.5	102 -/+ 0.5	102.5 0.5-/+	102.6 0.5-/+	102.3 0.5-/+	102.2 0.5-/+	102 -/+ 0.5	102 0.5-/+	102.4 0.5-/+	F 102.3
Pulse rate	73 -/+ 1	74 1 -/+	73 1 -/+	76 1 -/+	75 -/+ 1	76 1 **-/+**	74 1 -/+	78 1 -/+	77 1 -/+	70 -/+ 1	71 1 -/+	73 1 -/+	70-80
Respiratory rate	17 -/+ 1	16 1 -/+	14 1 -/+	15 1 -/+	12 -/+ 1	14 1 -/+	13 1 -/+	16 1 -/+	15 1 -/+	14 -/+ 1	13 1 -/+	17 1 -/+	20 -12

Adapted from The Veterinary Science Project Book, Unit I: Body Temperature, Pulse and Respiration Rate pages 16 to 20.2014

Table 4: Hematological values

	Case no												Reference values*
	1	2	3	4	5	6	7	8	9	10	11	12	
Parameters													
PCV %	30	30	32	31	34	33	35	33	32	31	30	30	22 – 38
HB(g/dL)	9	9.5	9.8	9.5	10.5	10	12	10	9.9	9.5	9.5	9.5	8 – 12
R.B.Cs (x106//µL)	12	12	13	12.5	14	13.5	15	13.5	13	12.8	12.5	12.3	8 – 18
Total W.B.Cs (x103//µL)	8.2	8	8.3	8	9	8.5	9	8.5	8	7.9	9	8	4 – 13
Lymphocytes (%)	56	56	54	56	57	58	58	56	57	62	60	53	50 – 70
Monocytes (%)	1	1.2	3	1.5	2	2.2	2	2.8	3	3.3	3.6	3	0 – 4
Neutrophils (%)	42	40	40	38	35.7	35	35	37	37	30	31	41	30 – 48
Eosinophils (%)	1	3	3	4.4	5	5	5	4	3	5	5	3	1 – 8
Basophils (%)	0	0	0	0	0	0	0	0	0	0	0	0	0 – 1

*Reference values adapted from Online Journal of Animal and Feed Research Volume 3, Issue 1: 80-86 (2013)

(Case no (1

:A- Clinically

Adult goat weighting 25 Kg was operated to induce transverse fracture in the midshaft of the femur. Bony shuttle pin splint (camel metacarpal bone) was applied without any external support. The animal stood on its operated limb on the 5th day after operation and walked on the 19th day .without any complications

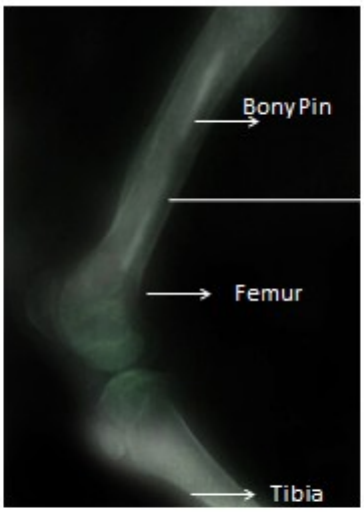
:B- Radiographically

X-Ray was taken immediately after operation to check the fractured

Region and the position of bony pin (Fig .12).Another radiographs were taken after8, 12 and 25 weeks (Fig13) & (Fig14).Radiographs showed proper alignment of the fractured segments and full absorption of the .splint bone at the fractured area

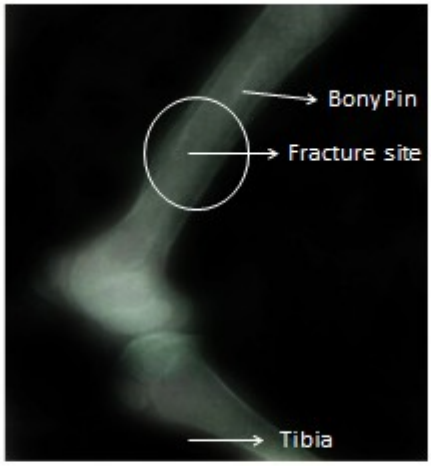
Case 1.1

Fig.12 X-ray image was taken immediately after the procedure showed that the splint bone placed properly .



Case 1.2

Fig.13 X- Ray after 3 months post operation showed a partial absorption of the splint bone

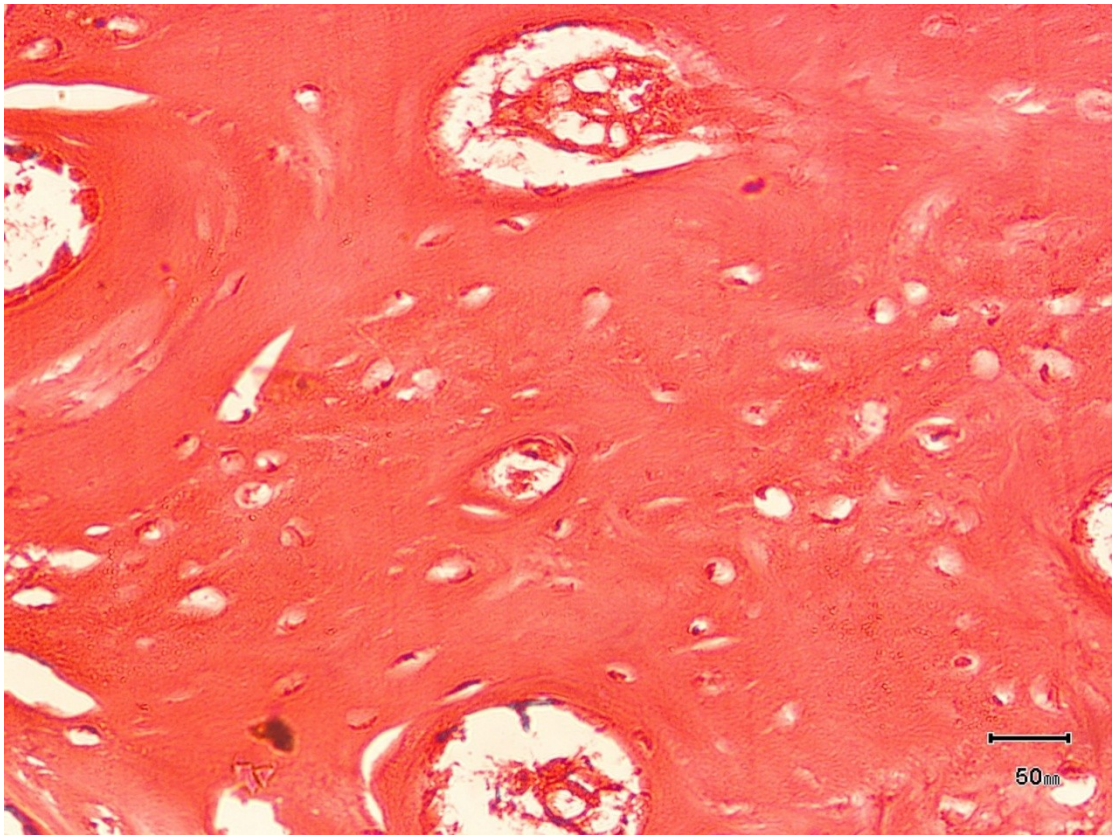


Case 1.3

Fig.14 X-ray image after 6 months of the operation showed the full absorption of the splint bone at the fractured area

:C- Histological

H&E stain shows the normal structures (Osteocytes, Osteoblasts and marrow space) that indicates good healing and complete union with .normal ossification



(Case no (2

:A- Clinically

.kg Adult goat was operated to induce an oblique femoral fracture 22

Bony intramedullary pin (camel metacarpal bone) was applied without

.any external splint

The animal stood on its operated limb on day 7 after operation and

Walked at the 15th day after operation.Nocomplicationsappeared.After

.one month the animal started to jump

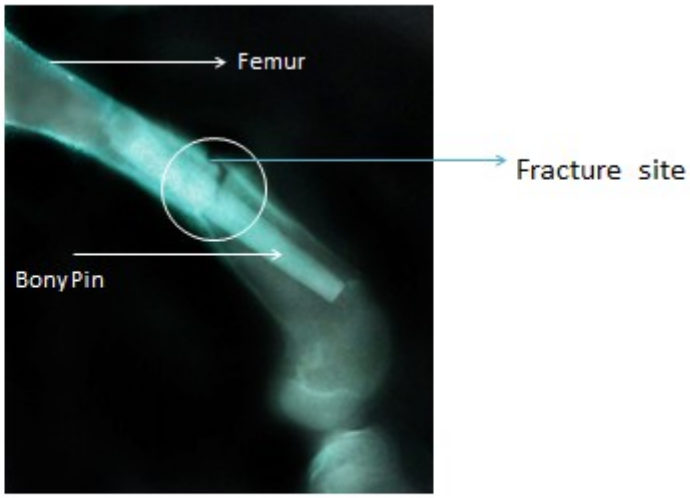
:B- Radiographically

X-Ray was taken on day one after operation to check the fractured region

.(and the position of bony pin (Fig.15

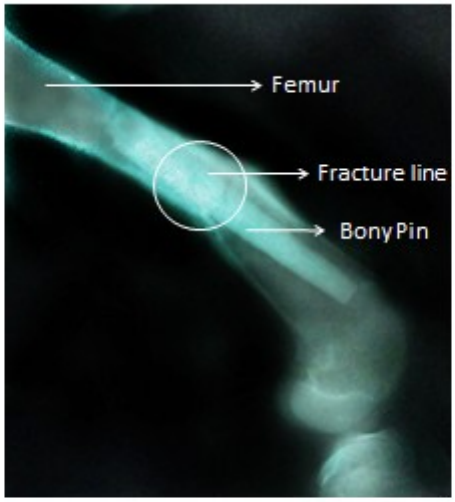
After 8 weeks callus formation ((secondary callus)) started to cover the

.(distal and proximal segments of the Femur (Fig.16



Case 2.1

Fig.15 X- Ray image immediately after the procedure showed the bony pin and the fractured segments

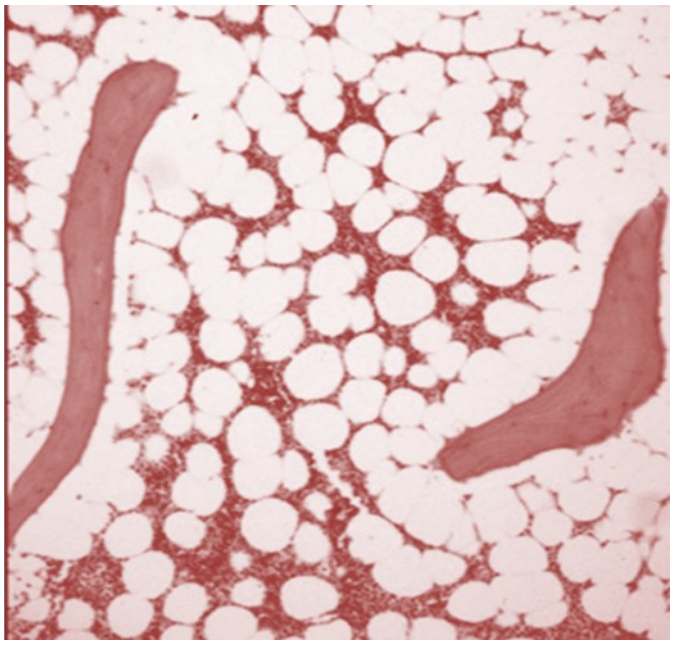


Case 2.2

Fig.16 After 8 weeks callus formation ((secondary callus)) started to cover the distal and proximal segments of the Femur

:C- Histological

Histology slide of decalcified bone marrow from Femur revealing normal bone and the surrounding hematopoietic cells, as well as adipose tissue in .modularly cavity



(Case no (3

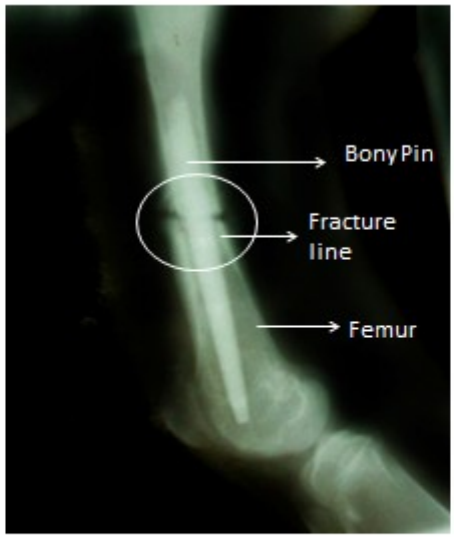
:A- Clinically

kg Adult goat was operated to induce an artificial oblique femoral 18 fracture and bony shuttle intramedullary pin was applied without any external supports. Palpation and clinical examination were done one week after operation. Animal stood on its operated limb on the day 7 after .operation

:B- Radiographically

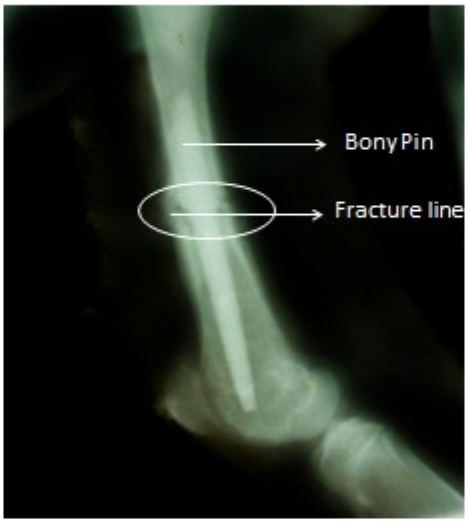
X-Ray was taken immediately after operation to check the pin position, (Fig.17), and another radiograph was taken after 4 weeks, early faint callus ((primary callus)) started to cover the distal and proximal segments of the Femur (Fig.18).

After 10 weeks dense callus ((secondary callus)) started to cover the distal and proximal segments of the Femur. Radiograph showed proper alignment of the fractured segments.(Fig 19).



Case 3.1

Fig.17 X- Ray immediately after operation



Case 3.2

Fig.18 After 4 weeks early faint callus ((primary callus)) started to cover the distal and proximal segments of the Femur

Case 3.3

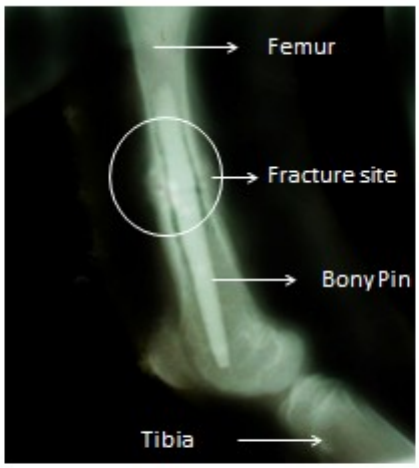
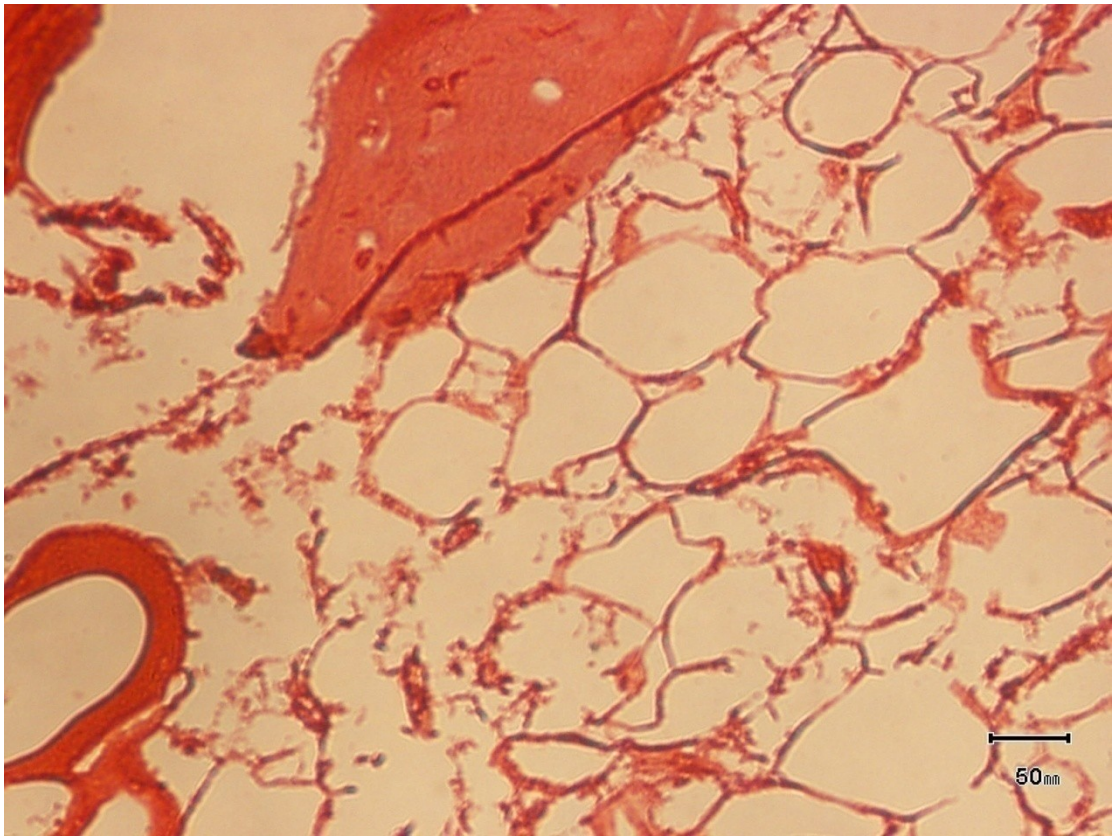


Fig 19 After 10 weeks dense callus ((secondary callus)) started to cover the distal and proximal segments of the Femur. Radiograph showed proper alignment of the fractured segments.

C - Histological

This is a histology slide of bone marrow , There are 3 normal elements in .the slides - bone trabeculae, adipose cells, and blood cells



(Case no (4

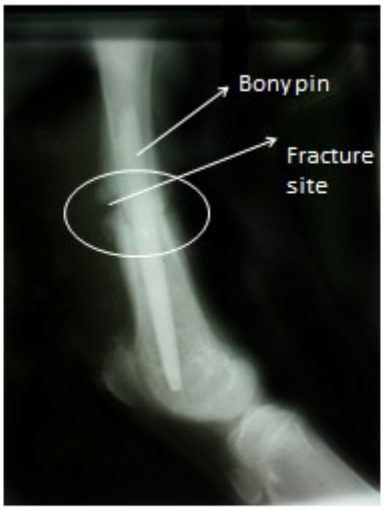
:A- Clinically

kg Adult goat was operated to induce transverse femoral fracture and 25 bony shuttle intramedullary pin was applied without any external supports .Animal stood on its operated limb on the 7th day after .operation .At day 27 after operation the animal walked

:B- Radiographically

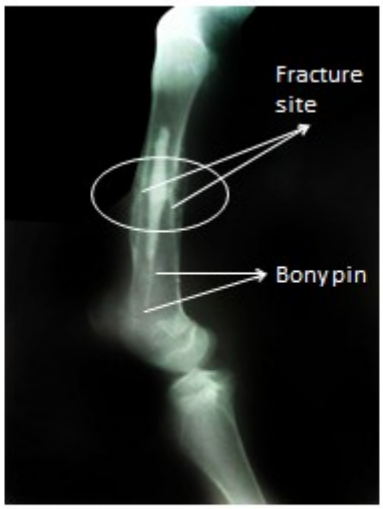
X-Ray was taken 15 days after operation to check the pin position inside the medulla. At the 2nd week, the primary callus formation started on the .(segments of the fractured femur. (Fig 20

The second X- Ray was taken 12 weeks after operation and showed good healing, proper alignment and beginning of the bony pin absorption. (Fig 21).



Case 4.1

Fig.20 X- Ray taken 15 days after operation showed fractures site with faint callus



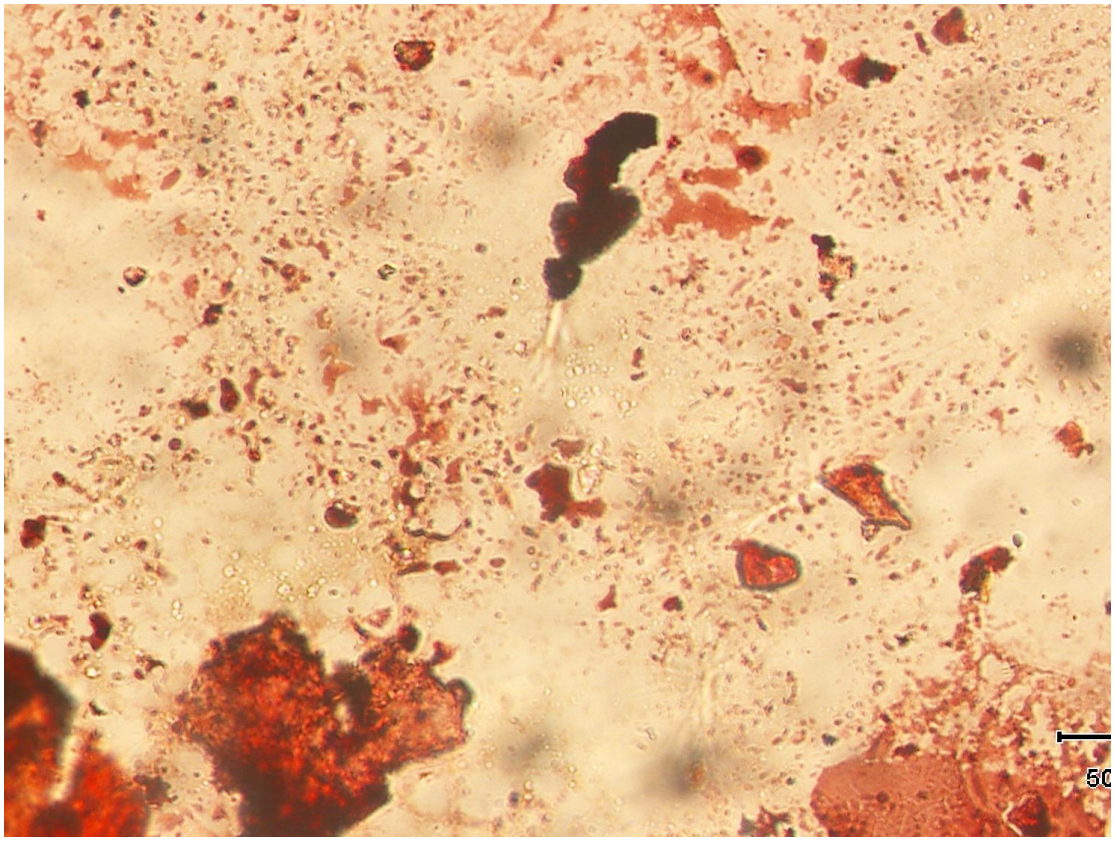
Case 4.2

Fig.21 X- Ray 12 weeks after operation showed good healing ,proper alignment and beginning of the bony pin absorption.

C -

Histological

This bone marrow smear revealing normal iron stores using Prussian blue stain. Normal iron stores are seen as dark blue stained material in the .bone marrow



(Case no (5

:A- Clinically

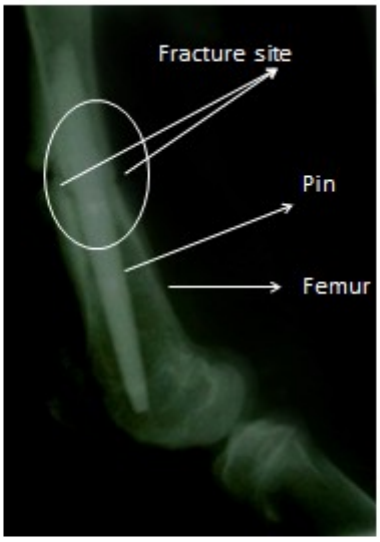
kg cross-breed goat was operated to induce transverse femoral -25 fracture and intramedullary bony shuttle pin was applied without any .external supports

The animal was able to put its weight on the affected limb on the 5th day post operation and stood on his operated limb on the day 13 after .operation

:B- Radiographically

X-Ray was taken immediately after operation to check the position of the bony shuttle pin.(Fig22). Another radiograph was taken 6 weeks after operation showed dense callus formation around the fractured segments .(and proper alignment. (Fig 23

The 3rd X-Ray was taken After 15 weeks post operation and showed proper alignment and good healing with partial absorption of the bony pin splint (Fig 24).



Case 5.1

Fig.22 X- Ray immediately after operation

Case 5.2

Fig.23 X- Ray 6 weeks after operation showed dense callus formation around the fractured segments and proper alignment.

Case 5.3

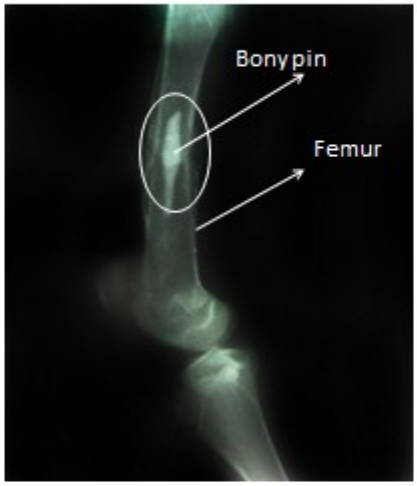
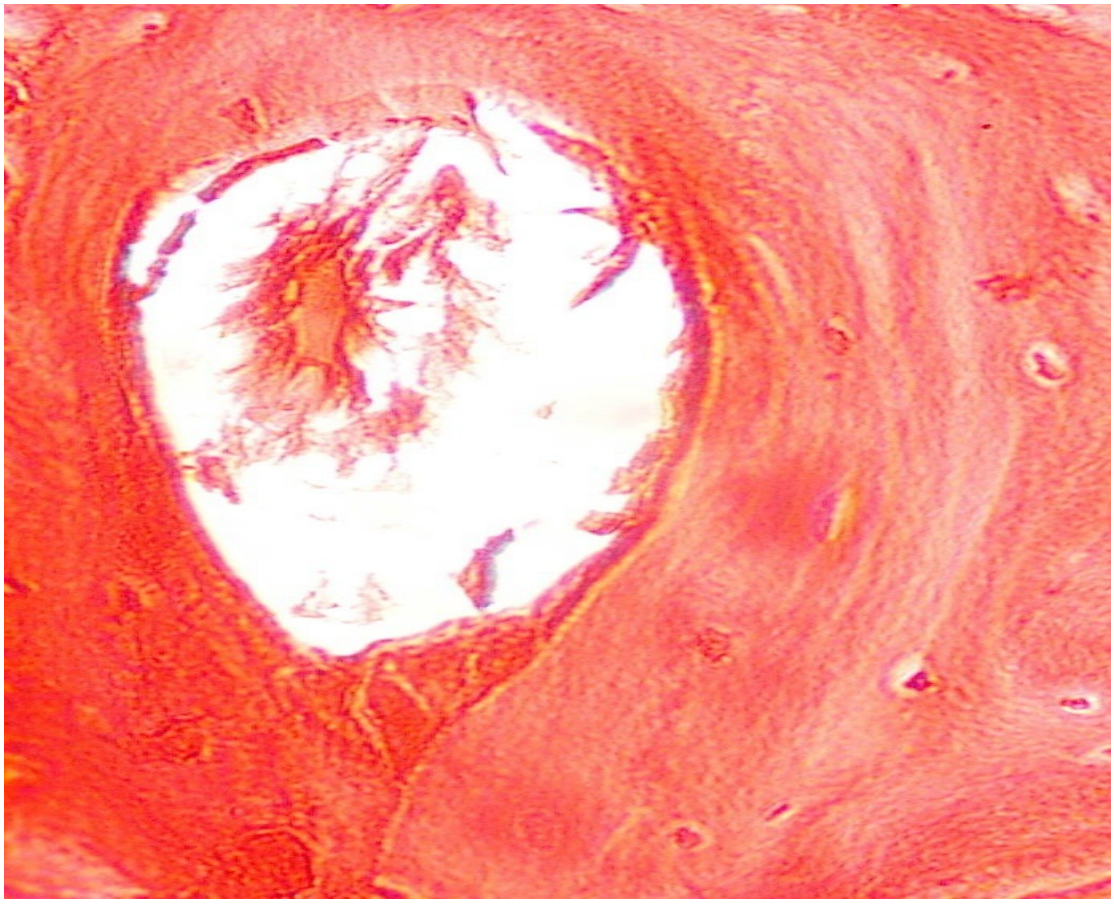


Fig.24 X- Ray 15 weeks after operation showed proper alignment and good healing with partial absorption of the bony pin splint.

C - Histological

H&E stain shows normal Osteocyte, osteoblast and marrow cavity .The normal structure indicates good healing and complete union with normal .ossification



(Case no (6

:A- Clinically

Adult goat weighting 28 Kg was operated to induce transverse fracture in the midshaft of the femur. Bony shuttle pin splint (camel metacarpal bone) was applied without any external support. The animal stood on its operated limb on day 8 after operation and walked on the 29th day without .any complications

:B- Radiographically

X- Ray was taken at day 15 after operation showed faint callus (Fig 25). The second X-Ray was taken 6weeks after operation and showed dense, strong (good) callus and proper alignment. (Fig.26).

Case 6.1

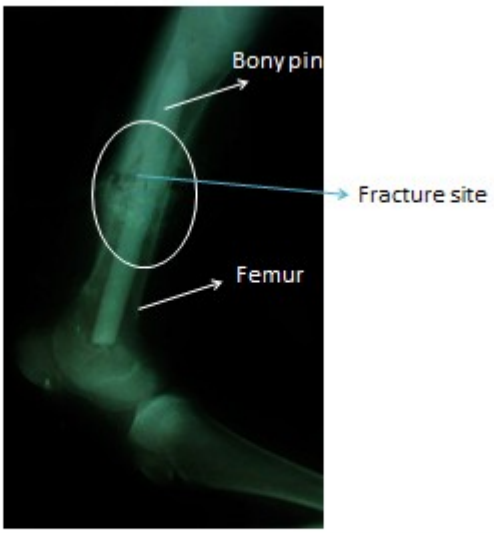


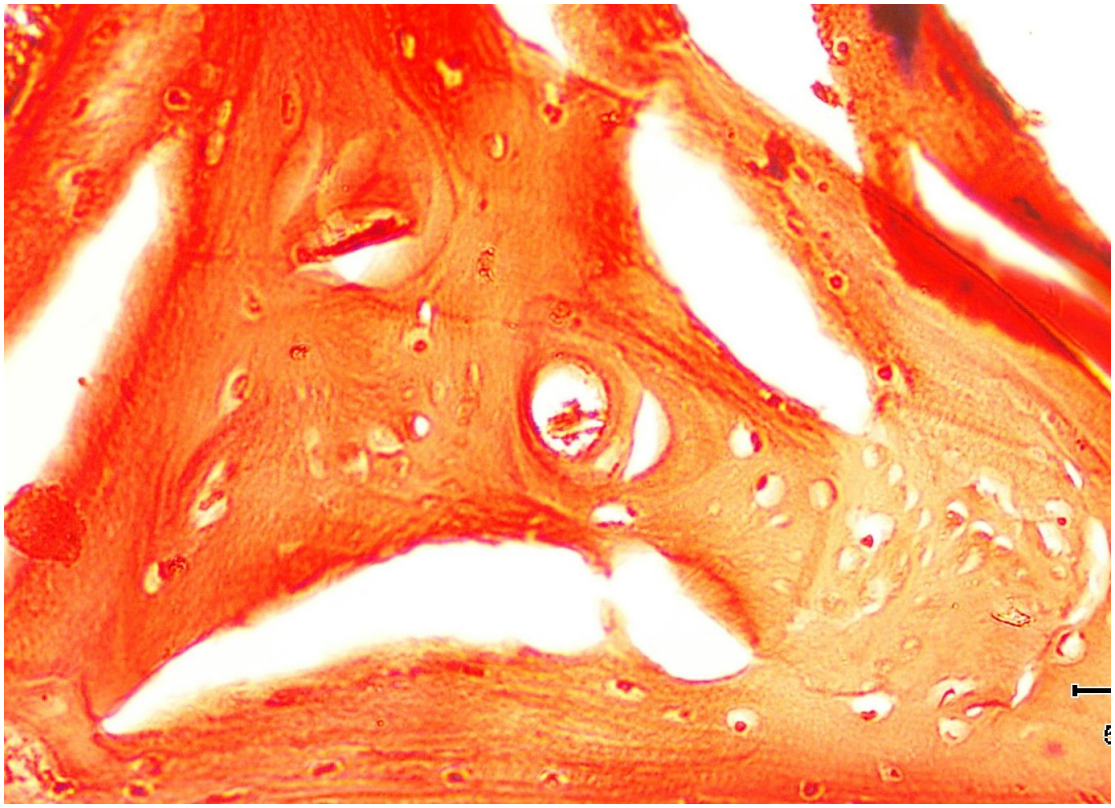
Fig.25 X- Ray 15 days after operation showed faint callus

Case 6.2

Fig.26 X- Ray 6 weeks after operation showed dense and strong (good) callus and proper alignment.

C - Histological

H&E stain shows normal Osteocyte, osteoblast and marrow cavity .The normal structure indicates good healing and complete union with normal .ossification



(Case no (7

:A- Clinically

kg Adult local breed goat was operated to induce a 20 .transverse femoral fracture

Bony intramedullary pin (camel metacarpal bone) was applied without

.any external splint

The animal stood on its operated limb on day 6 after operation and

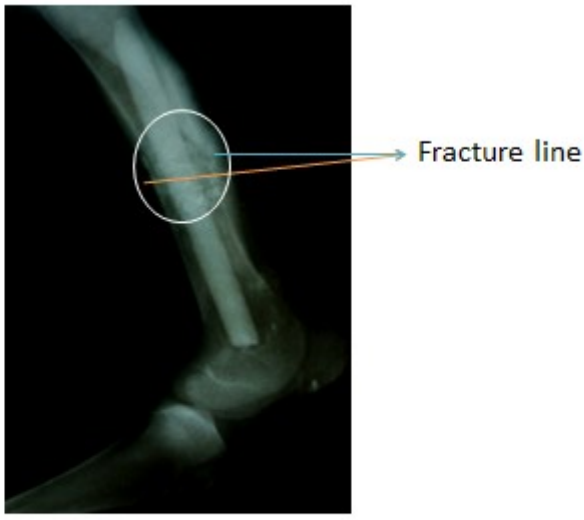
Walked at the 27th day after operation. No complications .appeared

:B- Radiographically

X-Ray was taken immediately after operation to check the fractured region and the position of bony pin (Fig.27).

After 8 weeks callus formation ((secondary callus)) started to cover the distal and proximal segments of the Femur with proper alignment ((Fig.28).

Fig.27 X- Ray immediately after operation

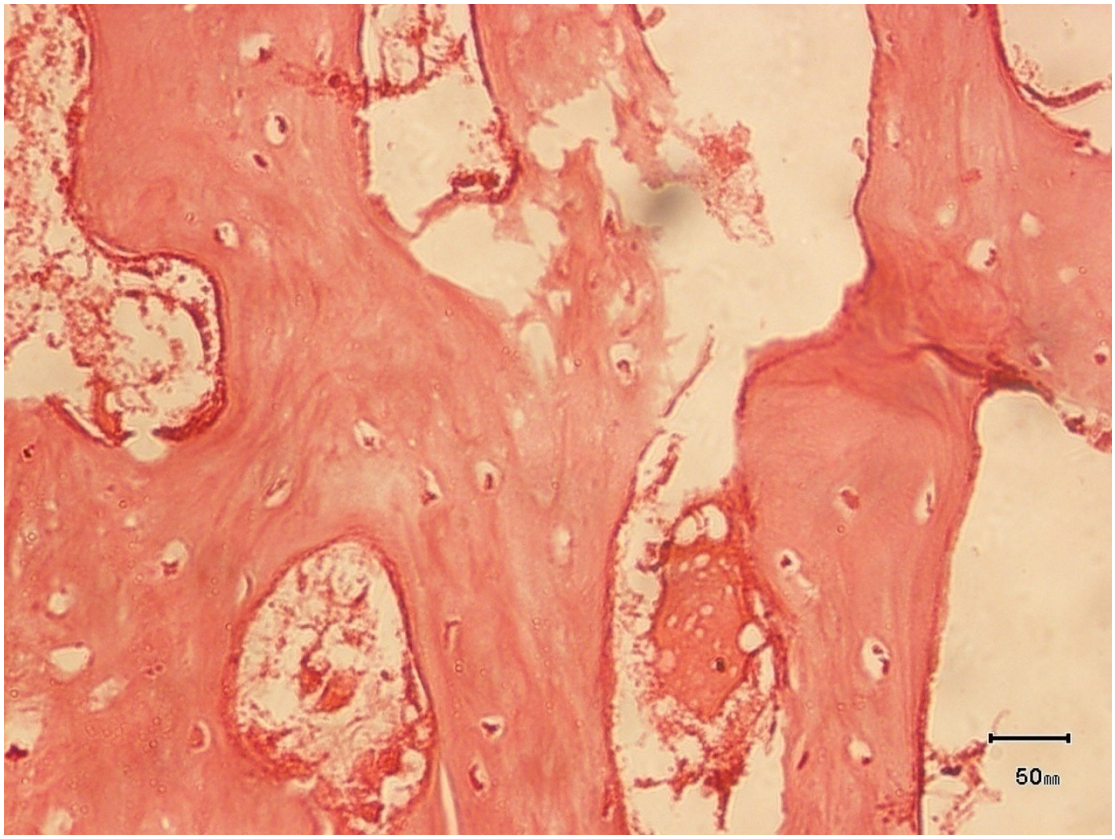


Case 7.2

Fig.28 X- Ray 8 weeks post operation showed fair callus

C - Histological

H&E stain shows normal Osteocyte, osteoblast and marrow cavity .The normal structure indicates good healing and complete union with normal .ossification



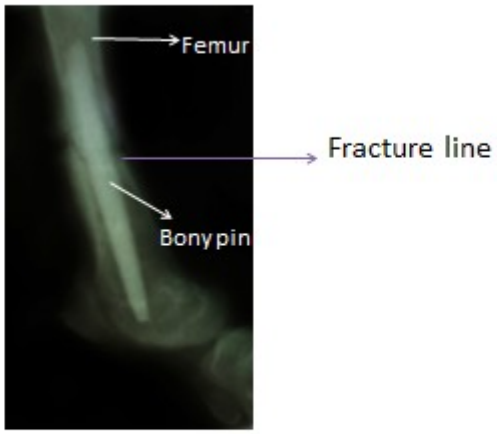
(Case no (8

:A- Clinically

kg Adult goat was operated to induce an artificial oblique femoral 18 fracture and bony shuttle intramedullary pin was applied without any external supports. Clinical examination was done one week after operation .Animal stood on its operated limb on the 8th day after .operation

:B- Radiographically

X-Ray was taken 15 days after operation to check the pin position, (Fig.29), and another radiograph was taken after 9 weeks showed good callus ((secondary callus)) that covered the distal and proximal segments of the Femur (Fig.30).



Case 8.1

Fig.29 X- Ray 15 days after operation showed early faint callus

Case 8.2

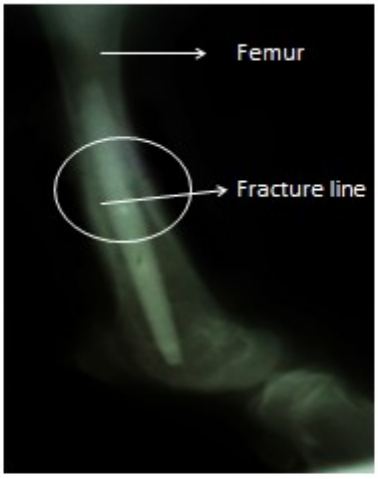
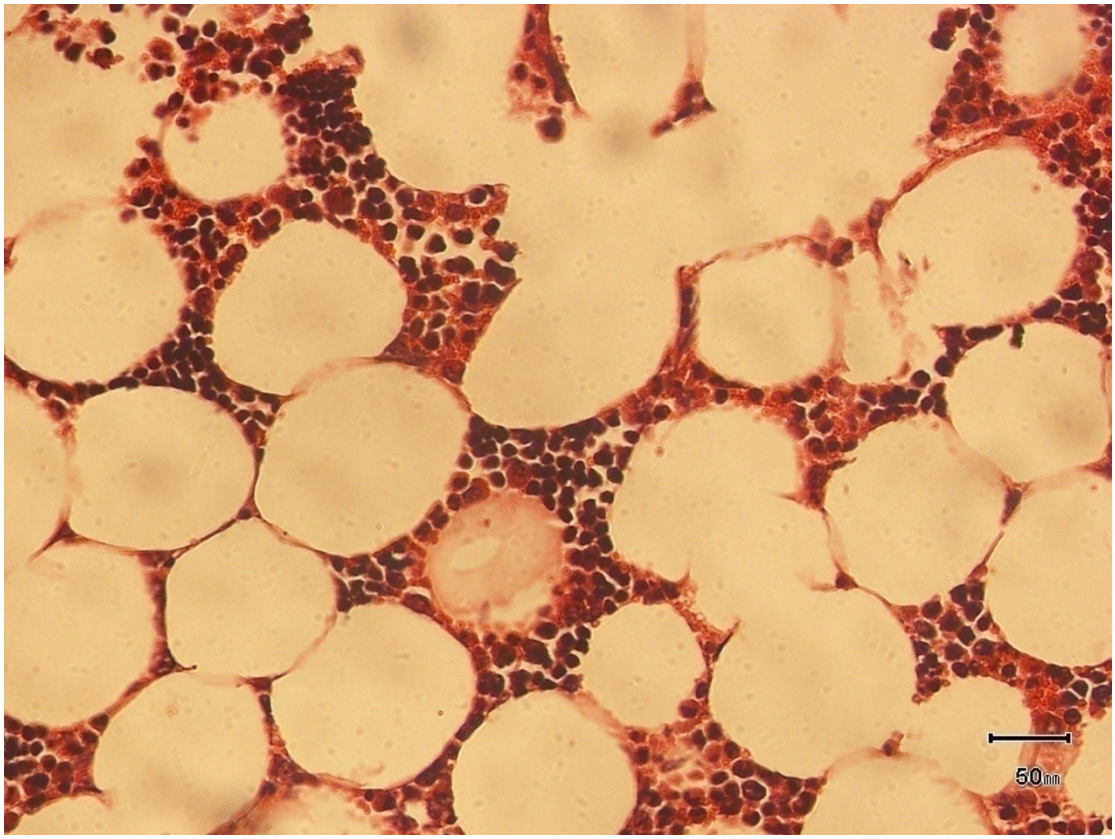


Fig.30 X- Ray was taken 9 weeks after operation showed good callus

C - Histological

This is a histology slide of bone marrow showing the typical cellular masses of developing blood cells lying between the round, empty fat .cells



(Case no (9

:A- Clinically

.kg Adult goat was operated to induce an oblique femoral fracture 30

Bony intramedullary pin (camel metacarpal bone) was applied without any external splint.

The animal stood on its operated Limb on day 6 after operation and Walked at the 29th day after operation. No complications appeared. After 5 weeks the animal started to jump.

B- Radiographically:

X-Ray was taken on day 15 after operation to check the fractured region and the position of bony pin (Fig.31).

After 6 weeks x-ray showed strong callus ((secondary)) and proper healing.(Fig.32).

Case 9.1

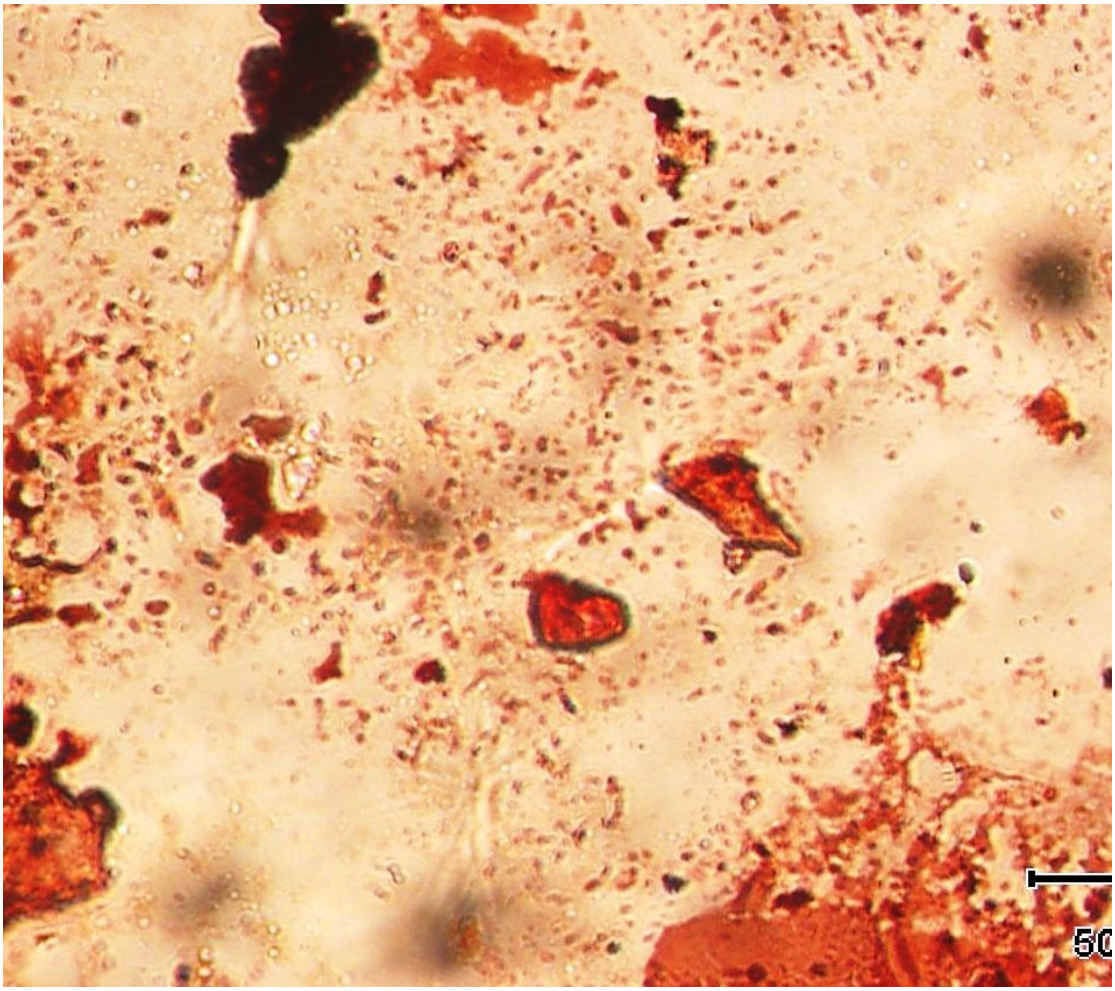
Fig 31 x-ray was taken 15 days post operation showed early and faint callus with good alignment.

Case 9.2

Fig.32 X- Ray 6 weeks after operation showed strong callus and proper healing.

C - Histological

Histology slide of bone marrow tissue showing a normal amount of iron stores using Prussian blue staining technique. Normal iron stores are seen .as dark blue-staining material in the bone marrow



(Case no (10

:A- Clinically

kg Adult goat was operated to induce transverse femoral fracture and 27 bony shuttle intramedullary pin was applied without any external supports .Animal stood on its operated limb on the 5th day after .operation .At day 25 after operation the animal walked

:B- Radiographically

The 1st X-Ray was taken immediately after operation to check the pin position (Fig 33). After 6 weeks the second x-ray showed good alignment, proper healing and beginning of the absorption of the bony .(splint. (Fig 34

The third X- Ray was taken 16 weeks after operation and showed good callus and partly absorption of bony pin (Fig 35).

X- Ray taken 12 months after operation showed complete absorption of the bony pin with very good healing (Fig 36).

Case 10.1

Fig.33 X- Ray immediately after operation

Case 10.2

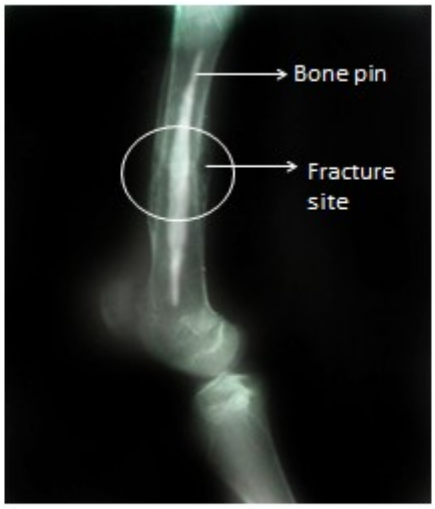


Fig.34 X- was taken 6 weeks after operation showed good alignment , proper healing and beginning of the absorption of the bony splint.

Case 10.3

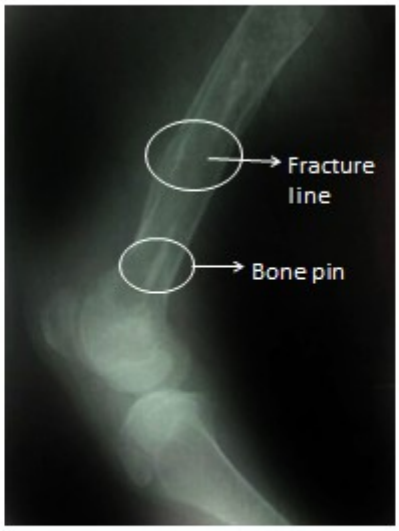
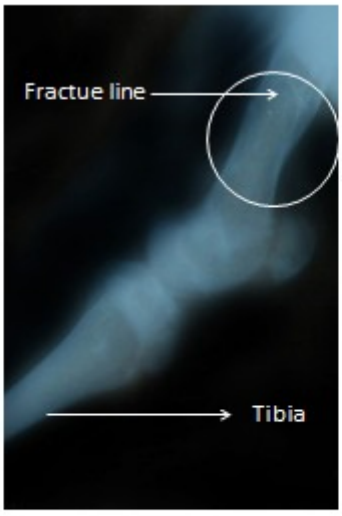


Fig.35 X- Ray was taken 16 weeks after operation showed good callus and partly absorption of bony pin

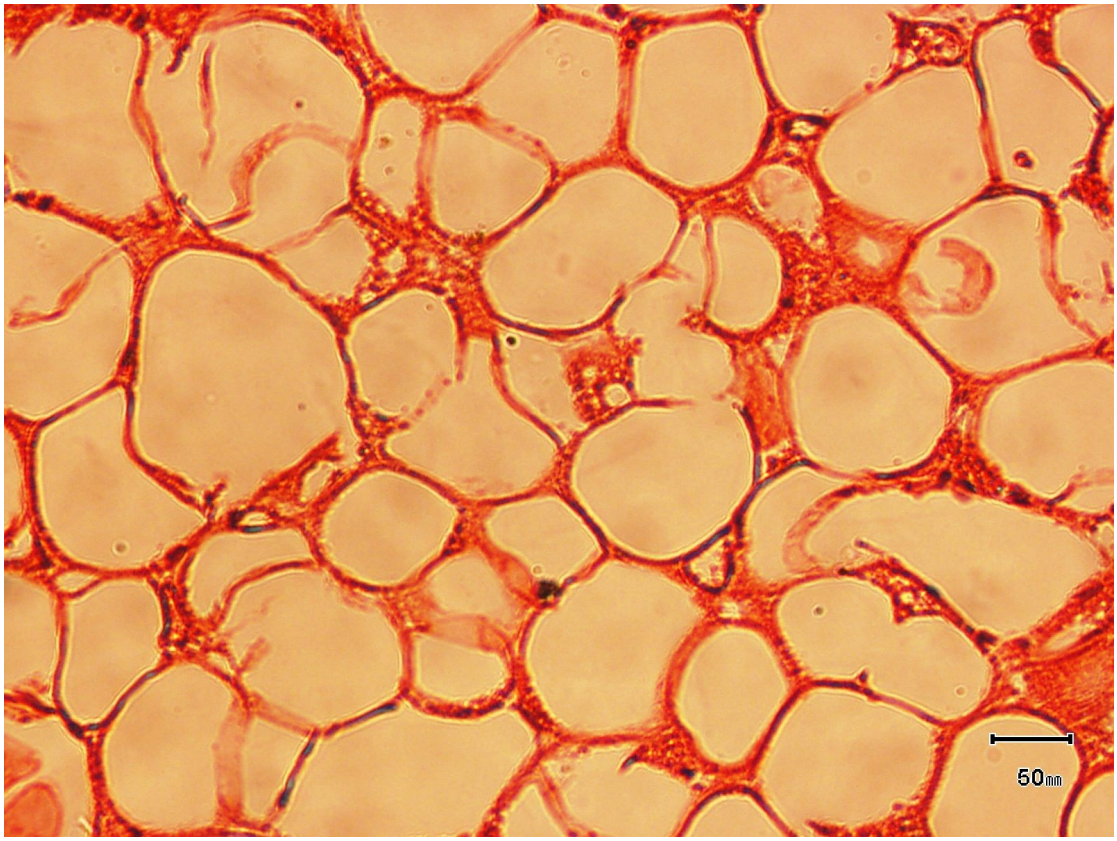


Case 10.4

Fig.36 X- Ray taken 12 months after operation showed complete absorption of the bony pin with very good healing

C - Histological

Histology slide of bone marrow showing the normal cellular masses of .developing blood cells lying between the round, empty fat cells



(Case no (11

:A- Clinically

kg Adult cross breed goat was operated to induce 25 .femoral fracture

Bony intramedullary pin (camel metacarpal bone) was applied without

.any external support

The animal stood on its operated leg on day 10 after operation and

Walked at the 26th day after operation. No complications .appeared

:B- Radiographically

X-Ray was taken immediately after operation to check the (fractured region and the position of bony pin (Fig.37

Another X- Ray was taken 8 weeks after operation and showed dense and .(good callus. Site of the fracture hardly seen (Fig.38

Case 11.1

Fig.37 X- Ray immediately after operation

Case 11.2

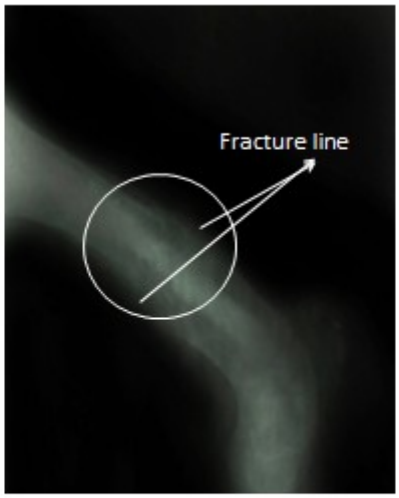
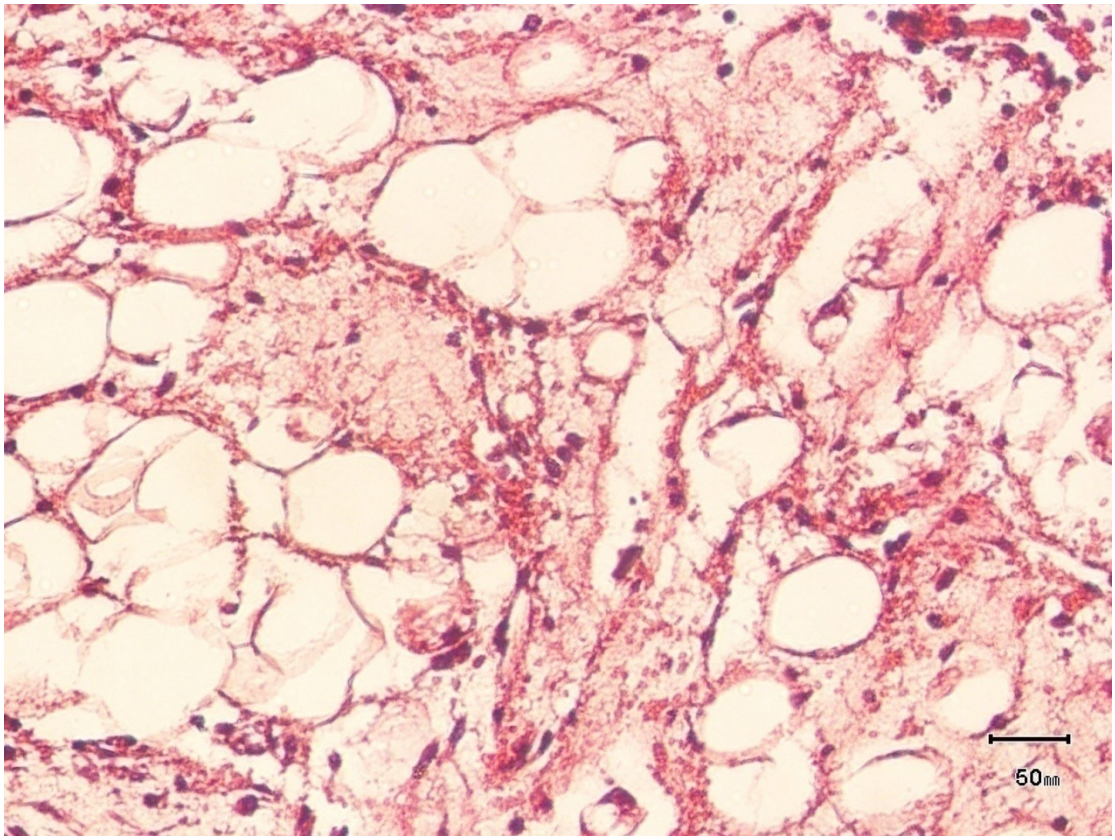


Fig.38 X- Ray was taken 8 weeks after operation showed dense and good callus . Site of the fracture hardly seen

C - Histological

Bone marrow showing the typical cellular masses of developing blood .cells lying between the round, empty fat cells



(Case no (12

:A- Clinically

kg Adult local breed goat was operated to induce a 20 .transverse femoral fracture

Bony intramedullary pin (camel metacarpal bone) was applied without

.any external splint

The animal stood on its operated limb on day 7 after operation and

Walked at the 25th day after operation. No complications .appeared

:B- Radiographically

X- Ray taken 30 days after operation showed good callus with good alignment. (Fig 39).

The second x-ray was taken 2 months after operation showed very good healing and beginning of the absorption of the bony pin.(Fig 40).

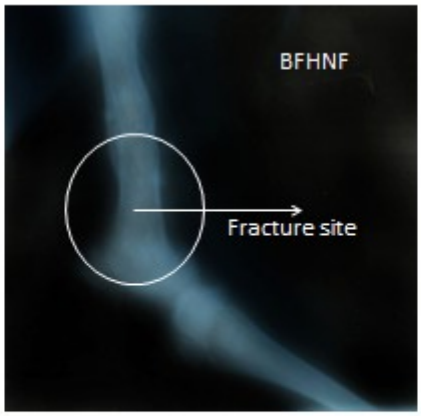
After 8 months the x-ray showed complete absorption of the bony pin .(with very good healing and hardly seen the site of fracture.(Fig 41

Case 12.1

Fig.39 X- Ray taken 30 days after operation showed good callus with good alignment.

Case 12.2

Fig.40 X- Ray was taken 2 months after operation showed very good healing and beginning of the absorption of the bony pin.



Case 12.3

Fig.41 X- Ray taken 8 months after operation showed complete absorption of the bony pin with very good healing and hardly seen the site of fracture.

C - Histological

This is a histology slide from the fracture site shows normal bone marrow structure with normal amount of iron stores using Prussian blue staining technique. Normal iron stores are seen as dark blue-staining material in .the bone marrow