ROLE OF AUTO - OMENTAL GRAFT ON THE FRACTURE HEALING AFTER PERIOSTEUM DESTRUCTION, RADIOGRAPHIC STUDY.

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ABSTRACT

The aim of this study is to evaluate the effect of the auto-omental graft on the fracture healing after destruction of the periosteum around the fracture site in rabbits. Eight mature healthy rabbits of local breed were employed to performed transverse fracture in the mid shift of the femoral bone, under general anesthesia and highly aseptic technique, then destruction of the periosteum was done about 1 cm away from each end of the fragments bone. The immobilization by intramedulary pinning, then the animals were divided into two equal group. The control group was left to follow the healing process, while in the treatment group the auto- omental graft was used to cover the fracture site. This graft was taken from the laparotomy of the left side and weekly radiographic examination performed for 10 weeks. The result is revealed that the omental graft play an important role in promote the fracture healing which was evident during the early new bone formation at the end of the second week compare to the control group which the sign of the callus formation was obvious lately at the end of the third week. The nature of the callus formation of the treatment group was limited to the fracture site and quickly cross the fracture site .While in the control group the new bone formation was heavy unlimited and need 8-9 week to bridge the fracture fragments. The omental graft play role in starting the remodeling phase, by decreasing the amount of the callus formation, with the signs of increase of the callus density, and marked of incorporation of the callus formation with the cortical bone.

INTRODUCTION

The fractures are one of the most difficult problem in the orthopedic surgery, were fixation methods and healing process including from complex process of physiology and biochemistry that effect on human and animal health (1).Since many years ago, new methods of internal and external fixation methods were estimated (2).Many of the biological approach were employed to estimate the promoting tissues repair and regeneration. These methods can treat and in some instant prevent complications of musculoskeletal injuries or problems of failed or inadequate healing (3and4),.Reconstruction of the vascularity is an early event of fracture healing and

up regulation of angiogenesis may therefore promote the formation bone Periosteum is important for mediating the primary steps of chondrogenesis and endochondrial ossification in the fracture hematoma and that the fracture hematoma may be essential for periosteal cells proliferation during fracture healing (5).The effectiveness of periosteal stripping in accelerating the rate of longitudinal growth in an immature long bone has been demonstrated by many workers (6).

The omentum is indeed an organ of exceptional versatility, it can be converted into vascularized pedicle graft, which can be put to use through out the body (7). The omentum is undoubtedly the most versatile organ in that it finds wide applications in almost all branches of surgery (8and9). The free graft of autogenous greater omentum could stimulate the formation of competent bone in an environment deprived of its normal vascularization, hence, it could be recommended to enhance healing when the fractures are at risk of nonunion (5).

The aim of this research was radiological evaluation of the effect of the autogeous omental graft on fracture healing after destruction of periosteum around the fracture site.

MATERIALS AND METHODS

Eight mature healthy male rabbits of local breed, weighting 1-1,6kg were used. The animals kept under the same condition of feeding and environment. Fasting the animals 24 hours prior to the operation. The thigh region was prepared aseptic surgically .A mixture of xylazine hydrochloride (2%) 20 mg/kg B.W and ketamine hydrochloride (5%) 40 mg/kg B.W intramuscular as general anesthesia (10).The animals were divided into two equal groups, control, and treated group. In control group a transverse fracture in the mid shift of the femoral bone was induced, then the periosteum was destructive about 1 cm away from the end of the fractured line of both fragments and fixed by intramedullary pinning (Steinmann stainless steel 2.4 x 120mm) by retrograde technique. While in treated group the same procedure with control except that omental graft which was taken laparotomy from the left side of the abdomen to cover the fracture site. Radiographic evaluation was performed for 10 week with the meideo-lateral view.

RESULTS

At the first week the radiographic appearances in both groups was include visible fracture line, sharp end of the fragment bone, and swelling of the soft tissues. While at the second and third week the fracture line still obvious, smoothness of the end of the fracture fragment, subsides of the tissues swelling, and still no periosteal reaction is visible in control group (Fig.1), but slight periosteal reaction around the fracture site, at second week in treated group (Fig.2), and at third week new bone formation around the fracture site was noticed .Slight periosteal reaction on the proximal and distal part of the fracture fragment toward the fracture line which is clear at fourth week in control group. But in treatmed group, more callus formation

around the fracture site at the same period and invisible fracture line (Fig.3).At fifth week in control group, new bone formation in the proximal and distal part far away from the fracture site growing toward the fracture line, and the fracture line still visible(Fig.4), but in treated group, the callus formation around the fracture line is dense, limited in the size and there is a sign of bridge to join the two fragments andfracture linewas complete disappear(Figr.5).

Heavy periosteal reaction around the fracture site, with irregular border and signs of bridge to join the two fragment of the fractured bone in control group at the sixth week (Fig.6). Treated group, invisible fracture line, and dense callus formation withdecrease in size around fracture line, at the similar period above (Fig.7). At the seven and eight week in control group, profound callus around the fracture site and invisible fracture line (Fig.8). And at the same period in treated group, limitation of the callus formation around the fracture site, with the signs of remodeling through incorporation of the callus with the cortical bone. At the nine week in control group, increase in the size of the new bone formation, and forming bridge to join the fracture fragment. While intreatment group, the remodeling phase continues to taken about the normal shape of the bone and the external callus decrease in size around the fracture site. (Fig.9).

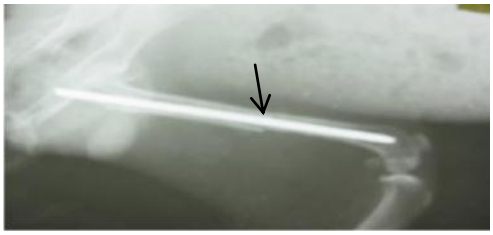

Figure1: Third week, in control group.no periosteal reaction, clear fracture line.

Figure 2: Second week, in treated group, Slight periosteal reaction near the fracture line (arrow), which is still visible.

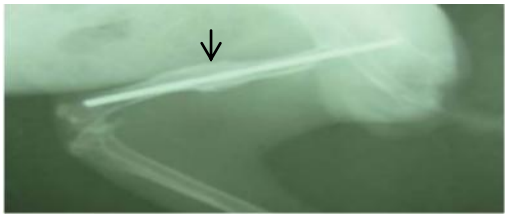

Figure.3: Fourth week in treated group, the external callus bridge the fracture site, invisible fracture line.

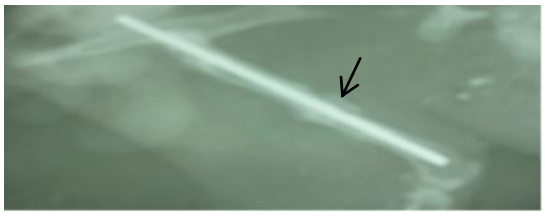

Figure.4: Fifth week in control group callus formation around the fracture line, and fracture line was still visible.

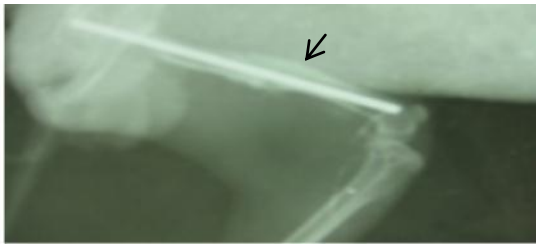

Figure 5: Fifth week in treated group, the callus formation cover the fracture site, invisible fracture line.

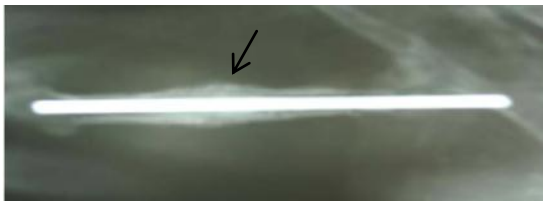

Figure 6: Sixth week in control group, the callus cross the fracture line to join the two fragments, invisible fracture line

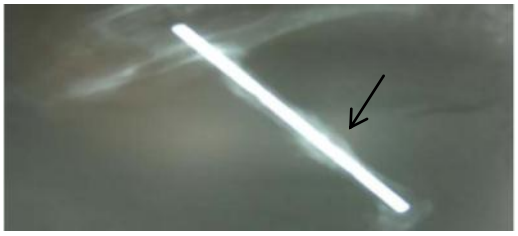

Figure 7: Sixth week, in treatment group. Decrease in the size of the callus around the fracture site, invisible fracture line

Figure 8: Eighth week, control group, callus bridge fracture line.

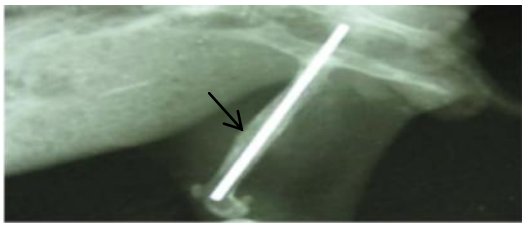

Figure 9: Ninth week, in treated group sign of remodeling process at the fracture site, and the bone may be taken the normal shape and the external callus decrease in size around the fracture site.

DISCUSSION

Stripping the periosteum from the bone can carries some estrogenic cells so if a segment of is excised and the periosteal tube remains this may successfully regenerate a new bone (11and12). The omental tissue have factor of vascular regeneration, which enhance formation of new blood vessels from surrounding tissues of fracture site, united with external periosteal blood vessels to supply fracture site (7). The radiographic examination revealed that in the treatment group, at the second weeks post operation slight periosteal reaction was seen away from fracture line (Fig.1), this may be due to the omentum around the fracture site that may enhance the formation of new blood vessels from surrounding tissue. These blood vessels were important for formation of callus around the fracture site and this observation agreed with (13).In treated group, at the fourth weeks, post-operation there was invisible fracture line, more developed callus around the fracture site when compared with control group at the same time. This may be due to the omental tissue which modify to fibrous connective tissue, and help to immobilize the fracture site and protection to auto growth capillaries in the area besides enhancing oxygen to reorganization to the osteocytes cells in the fracture site. And this was agreed with (5and7), whom mention the action of omentum to enhance the proliferation of osteoblast, also the omentum contains omnipoteal stem cells that can differentiate to a variety of cell types. While, in the control group at the same period slight new bone formation in fracture site. Decrease in callus formation around the fracture site at eighth and ninth week in both

groups (Fig.8and 9) respectively due to the remodeling of the bony formation at fracture site to lamellar bone and restored the bone contour faster in treated group than in control group. This observation comes in agreement with (12). This study concluded that the omental graft enhance the processes of fracture healing ,and that radiographicaly obvious in treated group faster than in control group.

دور طعم الثرب على التئام الكسور المنزوعة السمحاق الخارجي حول منطقة الكسر، دراسة شعاعيه

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الخلاصة

الهدف من هذا البحث هو متابعه شعاعيه لتأثير استخدام طعم الثرب المأخوذ من نفس الحيوان كبديل للسمحاق العظمي المنزوع حول منطقة كسر منتصف عظم الفخذ في الأرانب ,واستخدمت ثمانية أرانب بالغة ومن النوع المحلي، أجريت عليها عملية إحداث كسر مستعرض في منتصف عظم الفخذ، باستخدام شروط التطهير والتعقيم وتحت تأثير التخدير العام ، وتم إزالة 1 سم من سمحاق العظم حول منطقة الكسر من كل جهة من حافتي العظم المكسور. استخدمت طريقة التثبيت الداخلي بواسطة السفود داخل النخاع، وقسمت الحيوانات إلى مجموعتين وتحتوي على نفس العدد من الحيوانات .مجموعة السيطرة تركت بعد التثبيت وبدون استخدام أية مادة حول منطقة الكسر .أما مجموعة العلاج فتم استخدام قطعة من الثرب من نفس الحيوان خلال عملية فتح البطن و إزالة جزء من الثرب حول الانحناء الأكبر للمعدة,وتمت تغطية منطقة الكسر وحول العظم .بعد إعادة العضلات والجلد في كلا المجموعتين تمت متابعة كلا المجموعتين شعاعيا أسبوعيا لمدة 10 أسابيع .و أثبتت النتائج دور طعم الثرب المأخوذ من نفس الحيوان في تسريع التئام الكسور من خلال سرعة ظهور الثفن الخارجي في نهاية الأسبوع الثاني في مجموعة العلاج مقارنة مع مجموعة السيطرة التي لم يظهر فيها الثفن الخارجي إلا بعد نهاية الأسبوع الثالث , بالإضافة إلى أن شكل وحجم الثفن المتكون في مجموعة العلاج كان بشكل محدد حول منطقة الكسر بالإضافة إلى سرعة تكلس الثفن وسرعة إحداث الجسر لربط قطعتي العظم المكسورة,أما في مجموعة السيطرة فقد كان الثفن المتكون كثيف وغير محدد واحتاج إلى 8-9 أسابيع لربط قطعتي العظم المكسور.وتبين إن دور الثرب هو التعجيل في بداية مرحلة الصقل من حيث قلة الثفن المتكونة حول منطقة الكسر واختفاء خط الكسر مع زيادة كثافة الثفن المتكونة والحافات الخارجية الملساء بالإضافة إلى ظهور علامات واضحة لامتداد قشرة العظم مع الثفن المتكون خلال العظم الجديد المتكون مقارنه مع مجموعه السيطرة التي تأخرت فيها هذه العلامات حتى بعد الأسبوع التاسع.

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