تطويل الأطراف عن طريق فتح القشر العظمى باستخدام جهاز وغنار

د. أيمن الغراري/كلية الطب البشري/غ
د.الصادق بن دله/كلية الطب البشري/غ
د.نجية المهدويكلية الطب البشري /غ
د.محمد بن راشد /كلية الطب البشري/غ

مستخلص:

تم تنفيذ خمسة وأربعون عملية إطالة للأطراف في قسم العظام في مستشفى الخضراء بطرابلس في الفترة ما بين أبريل 2006 وديسمبر 2010 و تم إجراء دراسة رجعية

طرق البحث : تم استخدام صور الأشعة السينية للقياس. جميع الحالات لدينا تم اجراها تحت التخدير العام. عظم واحد في وقت واحد. فغر العظم القاصي أو الأوسط ، إذا كان بعيدًا ، فنحن نصلح الجزء القاصي من الساق بمسمار واحد من أجل ثبات الكاحل. تم إدخال اثنين من مسامير Schanz في منطقة الميتافيزيل أعلى موقع استئصال القشرة ، آخر اثنين من البراغي أسفله مباشرة. نظرًا لأن جميع الحالات كانت لديها بضع العظم الميتافيزيل الداني ،تم استخدام شق جلد واحد ، تم إجراء شقين سمحاقيين متوازيين. تم استخدام منشار Gigli مع أو بدون ثقوب الحفر ، مما يحمي النخاع. جهاز Wagner تم تثبيته. تم إغلاق الجرح في طبقات فوق التصريف. أعطيت المضادات الحيوية بعد العمل الجراحي ، يتم فحص الأشعة السينية. في اليوم التالي للجراحة ، بدأ الإطالة والتسُجِّل على الرسم البياني. في المجموعة الأخرى ، استمر ضغط القشرة لمدة أسبوعين وبدأ الإطالة بنفس الطريقة. نطيل 1 ملم يوميًا ، ونراقب استجابة المريض. تم تعليم بعض المرضى كيفية استخدام الجهاز على أنفسهم رغم أن معظم المرضى ظلوا في المستشفى حتى يتحقق الطول الكامل. الفحص بالأشعة السينية قبل خروج المريض ، ما لم يتم اكتشاف مضاعفات. بمجرد أن يتم تحقيق الطول المستهدف ، تم قفل الإطار حتى يتم رؤية نوعية جيدة من العظام إشعاعيًا ثم تمت إزالة المثبت. خضع جميع المرضى للعلاج الطبيعي من أول يوم بعد العملية الجراحية

النتائج : تضم 45 مريضاً 10 ذكور (22٪) و 35 إناث (78٪) تم تطويل سبعة وعشرون ساقًا (60٪) و 17 فخذًا (37٪) وعضم ذراع واحدة (3٪) ، وتراوحت أطوال الطول بين 3 سم (18٪) و 11 سم (3٪) ، وكان سبب الإطالة هو مضاعفات التهاب شلل الاطفال في 38 من المرضى (84 ٪) واصابات الحوادث في 4 مرضى (9 ٪) و 3 مرضى (7 ٪) بسبب قصر خلقي.

المضاعفات: فقط 5 حالات (11٪) مصابة بالتهاب في فتحات الجلد الدبوسية ، وقد لوحظ انحناء في المحور الطولي أكثر من 5 درجات في 12 حالة (27٪) ، وقد لوحظ تشوه في وضعية القدم في 9 حالات (20٪) من إطالة الظنبوب ، لوحظ تصلب في الركبة في 11 حالة (24 ٪) من كل من تطويل الفخذ والساق ، لم يكن هناك التهابات خطيرة ولا تخثر وريدي عميق. مع هذه الدورة الطويلة من العلاج ، كان معظم المرضى يعانون من بعض المشكلات ، والتي تم حلها بالتدخل غير الجراحي ، حيث عانى معظم المرضى من ألم أو إزعاج أثناء فترة العلاج ، والذي تم علاجه بواسطة المسكنات أو عن طريق التوقف لمدة أطول من يوم إلى يومين.

الخلاصة: في جميع المرضى ، تم الحصول على الطول المطلوب دون أي مشاكل ميكانيكية خطيرة.

Corticotomy for Limb Lengthening using Wagner device

Dr. Aiman Buagrara

Prof. Seddiq Ben Dalla

Prof. Mohamed B. Rashed

Dr. Najia Mahdawi

ABSTRACT

Forty five limb lengthening procedures are carried out in the Orthopedic department in Alkhadra Hospital in Tripoli the period between April 2006 and December 2010A retrograde study done

Subjects and Methods Scanogram was used for measurement. All our cases operated under general anesthesia. One bone at a time, for the tibia we used the tourniquet. Distal or mid shaft fibular osteotomy ,if it was distal we fix the distal segment to the tibia by single screw for ankle stability. Two Schanz screws were inserted in the metaphyseal region above the proposed corticotomy site, another two screws just below it. As all our cases had proximal metaphyseal osteotomy ,one skin incision used ,two parallel periosteal incisions performed. Gigli saw was used with or without drill holes ,safeguarding the medulla. The Wagner apparatus then installed. The wound was closed in layers over drain. Antibiotic was given postoperatively ,check x-ray is taken. On the second postoperative day, lengthening started and recorded on chart In the other group the corticotomy kept compressed for two weeks and lengthening started in the same manner. We lengthen 1 mm per day ,monitoring the patient response. some patients were taught how to use the apparatus on themselves though most of the patients remained in the hospital until full length achieved. Control x-ray prior to discharge, unless complications detected . once the target length had been achieved the frame was locked until a good quality of bone was seen radiologically then the fixator was removed. All patients underwent vigorous physiotherapy from the first postoperative day

Results 45 patients includes 10 Males (22%) and 35 Females (78%)

Twenty seven tibiae (60%) , seventeen femora (37%) , and one humorous were lengthened (3%).Lengthening ranged between 3cm.(18%) to 11cm(3%).The cause of lengthening was residual poliomyelitis in 38 patients (84%) and traumatic in 4 patients (9%) and 3 patients (7%) due to congenital shortening.

Complication Only 5-cases (11%) had pin tract infection, Malalignement of the longitudinal axis more than 5-degrees was noticed in 12-cases(27%), Equinus deformity was noticed in 9-cases (20%) of tibial lengthening, Knee stiffness was observed in 11-cases (24%) of both femoral and tibial lengthening, There was neither serious infection nor deep venous thrombosis. With such an extended course of treatment, most of the patients had some problems, that resolved with nonoperative intervention, Most patients experienced pain or discomfort during the course of treatment, which was treated by analgesics or by stopping lengthen for 1-2 days.

Conclusion In all patients the desired length was gained without any serious mechanical problems .

Type 1: upward slope, the discrepancy increases with time

(60%) due to PPRP.

Type 2: upward slope deceleration increases for a time then slows down, seen in some cases of congenital and inflammatory conditions.

Type 3: upward slope-plateau pattern seen in over growth e.g. femur.

Type 4: upward slope-plateau –upward slope pattern e.g. Perth's hips.

Type 5: upward slope downward slope pattern e.g. Cerebral Palsy and Juvenile Rheumatoid arthritis .

Indications for limb lengthening have changed considerably over time. While devices and technologies have experienced a slow progression over the past few decades, there may be a noticeable advance with the recent introduction of internal magnetically lengthened nails.

The techniques for limb lengthening were originally developed for correction of limb length discrepancy (Sabharwal, 2015). Cosmetic lengthening has increasing interest and remains controversial.

Limb lengthening can be performed acutely or gradually. It can be done with internal fixation, external fixation, or a combination of both.

In modern history, acute distraction techniques have been described by several authors. Cauchoix and Morel in 1978 described a method of acute lengthening of the femur with internal fixation using plate and screws (Cauchoix, 1978). Major complications can be associated with acute limb lengthening, including acute nerve injury, acute vascular injury, delayed union or nonunion requiring bone grafting, and subsequent implant failure. These issues, in addition to limited lengthening amount, have led to limited use of acute lengthening in modern practice.

Gradual lengthening involves the common principles of (1) a low energy periosteum sparing osteotomy and (2) subsequent slow progressive distraction of the bone ends. The type of osteotomy, timing, rate of distraction and the distraction device can vary widely (Yasui, 2000). Gradual lengthening is the standard option and is the focus of the remainder of the article.

Leg lengthening procedures have developed rapidly in the past 20 years, especially distraction epiphysiolysis and corticotomy in an attempt to overcome the high rate of complication and problems using osteotomy procedures either by Ilizarov or wagner .Distraction osteogenesis by Ilizarov's method appears to be a most promising technique in treating these conditions (Cattaneo R. and et al (1992)),(Dendrinos GK,et al (1995)), (Marsh DR, et al (1997)),(Paley D, et al (1989)) . Currently, it is believed that the delicate distraction rate of 0.25 mm every 6 h is optimal for creating new bone and that acute correction impairs medullary blood supply, which in turn inhibits osteogenesis (Ilizarov GA (1990)). Therefore, sophisticated lengthening devices such as Ilizarov ring fixator are now commonly used (Cattaneo R. and et al (1992)),(Dendrinos GK, et al(1995)),(Marsh DR, et al (1997)), (10. Naggar L, et al (1993)), (Paley D, et al (1989)) . In developing countries where Ilizarov's apparatus is often not affordable.

They use Wagner first introduced his monolateral external fixator in 1978 (Wagner, 1978). Monolateral fixators are used on one side of the bone, formed of a rail or a telescoping body and clamps with a distractor device for lengthening. These devices are secured to the bone using conical or tapered half-pins.

Osteotomy Techniques

Ilizarov performed a percutaneous subperiosteal “corticotomy”, with the premise that preservation of the intramedullary blood supply was important to the quality of new bone formation (Paterson, 1990)

De Bastiani described a subperiosteal osteotomy performed in a low energy fashion with multiple drill holes and osteotomy. He also recommended preservation of the periosteum and repairing it after the osteotomy is complete (De Bastiani, 1987; Aldegheri, 1993, 1997).

Paley et al. described the percutaneous Gigli saw technique where a Gigli saw is passed subperiosteally to complete the osteotomy (Paley, 1991).

Frierson et al. demonstrated in an animal study that bone lengthening can be successfully achieved after complete transection of the medullary canal and that there is no histologic or radiographic difference between the corticotomy described by Ilizarov and the transverse osteotomy described by De Bastiani (Aldegheri, 1994).

Subjects And methods:

In the Orthopedic department in Alkhadra Hospital in Tripoli the period between April 2006 and December 2010A retrograde study done 45 cases of Limb shortening were lengthened by corticotomy using Wagner apparatus. Scanogram was used for measurement. All our cases operated under general anesthesia. One bone at a time, for the tibia we used the tourniquet. Distal or mid shaft fibular osteotomy ,if it

was distal we fix the distal segment to the tibia by single screw for ankle stability. Two Schanz pins were inserted in the metaphyseal region above the proposed corticotomy site, another two pins just below it. As all our cases had proximal metaphyseal osteotomy ,one skin incision used ,two parallel periosteal incisions performed. Gigli saw was used with or without drill holes ,safeguarding the medulla. The Wagner apparatus then installed.

Some patients had immediate distraction of 0.5cm ,the other had immediate compression. The wound was closed in layers over drain. Antibiotic was given postoperatively ,check x-ray is taken On the second postoperative day, lengthening started and recorded on chart for the first group.

Table Shows date -gained length –remarks and Dr. signature

Lengthening Chart

Patient's name :……Operation date :……..

Age :…… File No. :…….

In the other group the corticotomy kept compressed for two weeks and lengthening started in the same manner. We lengthen one mm per day monitoring the patient response. some patients were taught how to use the apparatus on themselves though most of the patients remained in the hospital until full lengths achieved. Control x-ray prior to discharge, unless complications detected. once the target length had been achieved the frame was locked until a good quality of bone was seen radiologically then the fixator was removed. All patients underwent vigorous physiotherapy from the first postop. day to minimize soft tissue complication and to maintain an adequate range of motion in the joints. Radiological evidence of bridging callus as well as clinical assessment was used as proof of union.

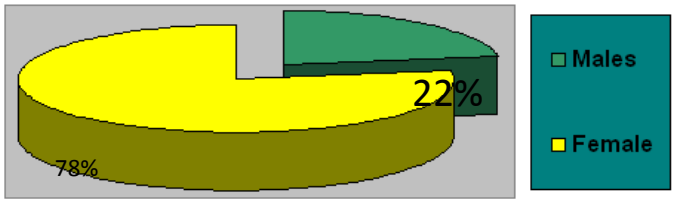
Results:

45 patients of limb shortening were lengthen by cortictomy using wagner apparatus.

GENDER DISTURBIOTION

These included 10 Males (22%) and 35 Females

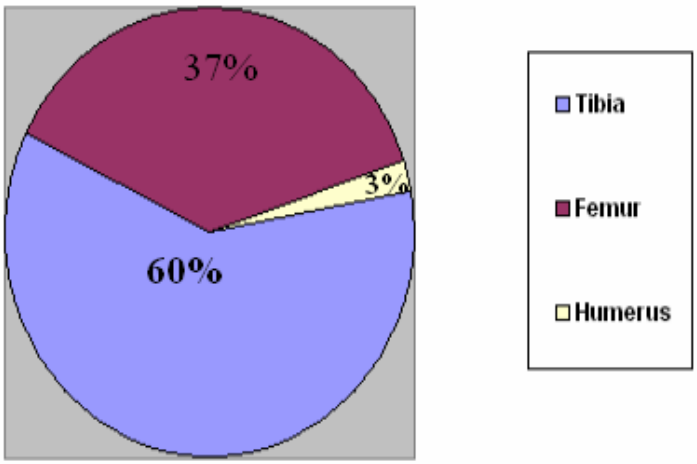
Date	Gained Length	Remarks	Dr. Signature



(fig. 1) Gender distribution.

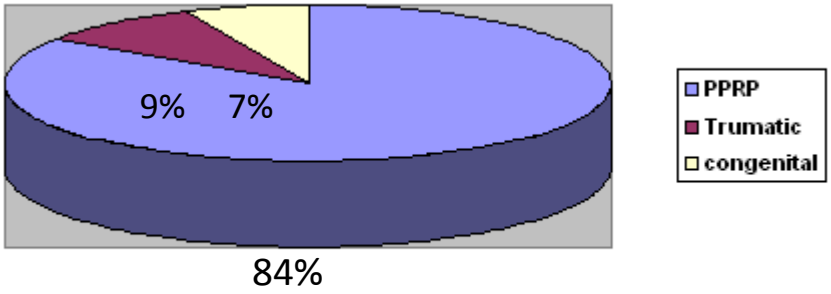
ANATOMICAL DISTRIBUTION

27 (60%) Tibiae, 17 femora (37%) and one Humerus (3%) were lengthened.



DIAGNOSIS

The diagnosis were PPRP 38 cases(84%), 4-cases were traumatic (9%) ,and 3-cases (7%) were due to congenital shortening .



(fig.3) Reasons of lengthening.

LENGTH RANGE DISTRIBUTION

The lengthening ranges from 3 cm. To 11 cm.

Range	No. Cases	%
3cm	8cases	18%
3.5cm	5cases	11%
4cm	6cases	13%
5cm	6cases	13%
6cm	8cases	18%
7cm	7cases	16%
8cm	2cases	5%
10cm	1cases	3%
11cm	1cases	3%

RESULT OF LENGTHENING

In all cases the desired length was achieved without mechanical problems.

BONE	RESULT	%
TIBIA	23 fully united	85%
	4 needed plating	15%
FEMUR	16 fully united	95%
	1 needed plating	5%
HUMERUS	1 fully united	100%

COMPLICATIONS

Complications	No. of patients	%
Pin tract inf.	5	11%
Knee stiffness	11	24%
Axis deviation >5	12	27%
Equinus deformity	9	20%

Only 5-cases (11%) had pin tract infection, they were treated without removing the pins. Malalignement of the longitudinal axis more than 5-degrees was noticed in 12-cases(27%), readjusting the apparatus was required to correct the deformity. Equinus deformity was noticed in 9-cases(20%) of tibial lengthening, ETA was required to correct the deformity. Knee stiffness was observed in 11-cases (24%) of both femoral and tibial lengthening, MUA was performed in two cases.

There was neither serious infection nor deep venous thrombosis. With such an extended course of treatment, most of the patients had some problems, that resolved with nonoperative intervention, some patients had pin tract infection that did not involve the bone. Five (11%)of them required local drainage and systemic antibiotics, routine pin care and oral antibiotics were prescribed at the first sign of soft tissue inflammation for 7 days. Most patients experienced pain or discomfort during the course of treatment, which was treated by analgesics or by stopping lengthen for 1-2 days.

Discussion :

Limb lengthening is being offered increasingly to various groups of patients to correct inequality of length or even short stature .The procedure have been reported as being successful , but with an incidence of complication ranging from 5% according to Ilizarov

(Ilizarov,1990) to 45% as reported for the method of wagner. The complication rate also varies significantly according to the nature of the disease causing the length discrepancy (Trivella,1996) (Aldegheri,1997). Our complication rate (8patients) is 18.8% is quite encouraging when compared to complication reported by (Wagner,1978) 45% (De Bastiani,1987) 14% and (Ilizarov,1990) 12%. Reports by Dahl revealed that the rate of major complication decreased substantially as the experience of the surgeons increased (Dahi, 1991). In one study the overall complication was 72%, but after 30 lengthening procedures , the rate began to decrease (final rate 25%). In our study we noticed that the axial deviation and knee stiffness is proportionally related to the length of distraction as it was noticed to be more in patients whom had 7 cm or more . This fact has been stated by other investigator (Dahl,1991) (Karger C,1993) (Stanitski D F,1996) other factors significantly associated with complications are age (Maffulli N, 1996) (Noonan Kj,1998) etiology (Aquerretta J D,1994)(Bell D F,1992)(Mezhenina EP,1984) associated deformity(Dahi M T,1994) (Glorion C,1996) and technique (Leyese M,1998)(Noonan K J,1998).

Infection was the most commonly encounter difficulty in some studies, recently reported rates of pin tract infection ranges from 10-100% (Maffulli N,1996)(Noonan KJ,1998) Ilizarov believe it to be an expected routine part of the lengthening procedure. In contrast only 5% deep infections is reported in our series, in one case loosening of the pins was noticed, where the screws changed to be inserted proximally. Early joint contracture remained a persisting problem during distraction, (Kargar C,1993) noticed a restriction of motion in all 73 lengthening and (Tjemstrom,1994) in 49 of 53 cases. In our series this joint contracture was a prominent problem (11 Knees and 9 Ankles) 44% of the whole sample, out of this 3 knees required M.U.A and in 3 ankles, ETA was done. The others improved on physiotherapy without any surgical intervention. Only 2 contractures remaining at an extended follow up, similar results reported by (Herzenberg,1994) and (Paley,1997) .Using Ilizarov device, neurologic deficit has been reported to be 15% (Dahi,1994). (Galdari,1990) reported more complication, with tibial lengthening exceeding 6 cm. In this series no one single case reported to have neurological deficit. Fracture of healing regenerate remained a

persisting complication and were reported it occur as often as 50% (Abe M,1996). (Dahi,1994) believed that axial deviation ,osteopenia and joint stiffness were a major risk.(Danziger MB,1995) noticed 8 of 9 femoral fractures occurred in lengthening beyond 5 cm, he recommended fixation after frame removal. In our series no fractures has occurred. Mild axial deviation occurred in 12 cases(27%), and was found to be related to the amount of distraction.

Finally limb lengthening requires a great deal of time and discomfort, but relatively it is a safe procedure.

Conclusion

The overall objective of any lengthening procedure is to minimize limb length inequality with minimal lasting iatrogenic morbidity. To that end, we achieved this in nearly all our cases

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