Current Technical Concept of Low Friction Arthroplasty for a Previous Hip Surgery

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The concept of the treatment of femoral neck fracture is still controversial in spite of accepted argument when internal fixation is indicated.

For example improved operative techniques of internal fixation has been the accepted method of dealing with these fractures, but there is no agreement as to what metallic devices produce the best results.

A failure rate of 50% is common in the literature and dissatisfaction with these results led to a number of investigations to develop mechanically improved fixation devices.

As far as internal fixation of the femoral neck fracture is concerned, Massie and his co-workers emphasize aseptic necrosis after long-term follow-up observation.

We agree with his general statement of the principles involving treatment of these fractures.

A failure of Jewett nailing for treatment of femoral neck fracture is obviously due to technical inability as well as to inadequate immobilization and this led to some rotation of the femoral head during surgery. It would have been for this case preferable to use sliding nails provided with separate lateral shaft fixation.

The purpose of this paper is to present a case where there was failed Jewett nailing which was converted to the Charnley low friction arthroplasty. In addition current emphasis on technical details of the Charnley low friction arthroplasty is introduced in the performance of this operation.

**Case Report**

A 53 year old housewife was transferred from another clinic on 24th July 1974 for revisional surgery of the right hip.

The patient was involved in a car accident on 8th July 1973 and sustained femoral neck fracture of the right femur.

Her health had been good previously and there were no other injuries except to the right hip. The laboratory workup was normal. The day after admission, she had had a hip nailing of Jewett type using a 135 degree triflanged nail. This operation resulted in a difficulty to achieve the impaction of the fracture fragment to procure adequate immobilization.

Some displacement of the triflanged nail is inevitable with increased rotation of the femoral head unless the sliding nail is provided.
with a separate lateral shaft fixation in a case like this. She was discharged and went home 8 weeks after the operation, asymptomatic and ambulatory with crutches.

10 months after operation, in May 1974, she complained of persistent hip pain. We noted some radiographic changes.

Discussion

A clinical case which led to the study described in this paper raises several interesting problems.

The first question is whether this 53 year old woman weighing 49kg, a failed Jewett nailing case, is suitable for a total hip operation or not. Post operative X-ray one year later, which we describe here, show misplacement of the Jewett nailing and enhanced rotation of the affected femoral head is demonstrable.

An appearance of absorption of the neck region accompanied by sclerotic change will inevitably lead to avascular necrosis of the femoral head. It appeared from the radiogram that there was some vitality in the femoral head.

In fact during the biopsy it was avascular. (Fig. 2, 3.)

Radiographically, the fracture fragment had not impacted at surgery and it was evident there was some rotation.

However it is demonstrable that Jewett fixation appliance is placed in the axis of weight-bearing in the frontal plane of the femur but it is apparently not adequate to provide for lateral shaft fixation. On the other hand the Jewett nail plate lies on the calcac to shorten the fulcrum of vertical torque on the appliance.

The foremost symptom was of great pain and the pre-operative hip function consisted of 2.2.3. of the 6 numerical grading of Merli daubigne. Careful observation regarding the performance of total joint replacement in the younger age group as in this case requires both the pseudo-arthritis test and the built in restrain test before assessing final evaluation and this was done.

There was here an obvious indication for conversion to Charnley low friction arthroplasty of the rt. hip.

During the operation, special reference was made to current technical details of Charnley low friction arthroplasty of the hip in the case of this patient.

With regard to Charnley’s teaching, it should be emphasized that preservation of all perioskeletal covering of the trochanter and lateral surface of the femur may facilitate maximum blood supply and therefore rapid union of the detached trochanter.

It is quite obvious that to avoid excessive callus formation and tenderness over the trochanter six weeks postoperatively is needed.

A special technical difficulty in the removal of the Jewett nailing is the inability to extract screws without preservation of periosteal covering of the lateral surface of the femur when the head may break off in the attempt. It is quite obvious that rather than leaving a large number of holes through the shaft of the femur (involving something like an hour of trauma to the femur before starting on the reconstruction) is undesirable so no attempt is made to trephine out the broken screws.

We prefer to fracture these screws in the medullary canal after breaking off the nail-plate junction of the Jewett nail.

We use for this purpose a long stone-crashing chisel struck like a chisel down the medullary canal. There is no need to fear this procedure and it is noticed that no problems and no insulation of the cement are reported in Wrightington hospital.

It is also imperative that there be no further
routine division of the external rotator during the exposure.

This is to avoid excessive lateral displacement of the trochanter which is disadvantageous in the present policy of working in the No. 3 position of the trochanter, or the position between 3 and 2 whichever is most advantageous for union.

In this case we used a radiographic template before operation in order to plan the level of the socket and therefore to guarantee restoration to the true length.

It is important that restoration of the full length by the correct position of the level of the socket will ensure that there will be no post-operative dislocation.

This entails (a) Correct reattachment of the trochanter as well as No. 3 position, or the position between 3 and 2. (b) absence of capsular resection or damage. (c) absence of anteversion of the socket, and (d) the use of a long posterior wall socket.

Moreover the deepening of the socket is done “by eye” rather than by palpation.

This depend upon finding the floor of the pulvinar which represents the cortical surface of the lateral surface of the “tear drop” as seen in the A.P. radiograph.

Reaming the femur into full valgus is preferred in this case.

This facilitates the insertion of a prosthesis in a valgus position with relation to the femoral medullary canal. This has been recognized as the accepted procedure at Wrightington hospital since 1970, after the first occurrence of fatigue fracture of the femoral prosthesis among heavy-weight patients. In addition, curretage of calcar femorialis is essential so as to remove all narrow tissue and weak cancellous bone which could prevent the bedding of cement at this vital point.

This feature is opposed to Charnley’s original teaching of avoiding curretage of the medullary cavity of the femur. In addition a springloaded wire 20kg compression force in each side is utilized for reattachment of the greater trochanter. The reason for the use of a spring loaded longitudinal wire is to ensure continuous coaptation when necrosis of soft tissue inside a loop of conventional wire would result in loosening. However, without the new Charnley wire tightener, some misplacement of the trochanter plate may result.

This is shown in post-operative radiogram (Fig. 4).

The procedure is to suture the fascia lata with the leg abducted and the use of figure-of-eight sutures to shorten the fascia if very loose in the abducted position.

Figure-of-eight sutures also produce a very water-tight suture line and prevent deep hematoma leaking into subcutaneous tissues. Finally enormous emphasis is now placed on careful suture of the skin edges. Loose suturing with no tension. Necrosis of skin edges by insensitive suturing considered to be an important source of defective wound healing. The pressure pad takes off all tension from the skin edges and therefore loose skin suture can be used.

Emphasise that all surgeons must suture their own skin so that the “hand-writing” of the surgeon is seen in the skin.

This policy appears to be producing much better wound healing than was the case in previous years at Wrightington hospital where suturing of the skin was left to the assistant.

Though the deep infection rate of the total hip replacement is certainly not more than 0.5% at Wrightington hospital. (until 1972) there has been 7 to 8% of defective healing of superficial wounds.

This is regarded as being a technical defect in method of suture.

It is also important that infection after an
alloarthroplasty is still quite frequent in spite of definite improvement of asepsis ("Greenhouse"). Moreover, total hip replacement following revisional surgery of the previous hip operation is somewhat more susceptible to infection. Under these conditions it is preferable that pre and post-operative prevention with antibiotics be carried out in spite of contrary opinions.

The fact that Polymethylmethacrylate releases remnants of monomer over a period of 18 hrs to 58 weeks is reported by König (1965) and Rauch-Puntigam and others. (1967)

Then Buchholz (1969) conceived the idea of mixing antibiotics with the bone cement. The general requirement for mixing several antibiotics with bone cements are: There must be stability against heat during the polymerization. Again there must be bactericidal action on a broad bacterial spectrum. Then it is also essential that there be little or no toxicity with as little influence as possible on the mechanical properties of the bone cement.

A low allergy rate is also important.

Buchholz tested the effectiveness of many antibiotics and came up with these results: The antibiotics known as Gentamycin, Penicilline, Cloxacillin, Cephalothin (Cephaloridine) Erycin and streptomycin are effective with Palaco for 48 weeks whilst Lincomycin is said to give 24 weeks duration of effectiveness after mixed it in to the bone cement. Whereas Tetracycline is not effective for this purpose. Nor is Penicilline recommended for use because of the allergy rate. Erycin has also the disadvantage of having a relatively high and rapid build-up of resistance in the same way as streptomycin.

At the time of writing we have not completed our comparison of CMW with Kanamycin and with Palacos and we have supportive vivo experiments of the clinical basis of LFA assessing old tuberculous hip.

The results will be reported in the near future.

The hydrophobic characteristics of bone cements require that the antibiotics be added as a sterile powder. The antibiotics to be added should be well mixed with the polymer before adding the monomer. We preferred to use 1 gram 2-amino-2-kanamycin known as kanendomycin mixed with 40 gram CMW for this patient following Shikita.

Summary

A case of technical failure of a Jewett nailing for femoral neck fracture is presented. In this case we preferred to convert to Charnley low friction arthroplasty of the hip joint with minimum soft tissue injuries.

The writers also used an antibiotic (2'-Amino-2'-Deoxy-KANAMYCIN) in to polymethylmethacrylate during the polymerization.

In addition current emphasis on technical details of the Charnley low friction arthroplasty is introduced with performance of this operation.


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<国文抄録>

股関節手術に適用する全置換術の新たな概念

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1. 이 논문의 요점은 先 執 術 關節全置換術的 適用論文に関して是 去若 其 對象은
現在 論文의 많은 요소는 명확히適用を選세를 때 現在 受理되어 있는 思考 方式을 維持
하나 預備 紹介 하였다.

2. 術式에 있어서는 Charnley 型 全置換人工關節全置換術を利用하였으며 Charnley
가 提示한 社會是 術式 및 強調하고 있는 點을 引用하여 本症例와 討論하였다.

3. 股関節全置換術において 無菌手術である 開離的 發展 및 其 應用度가 높아감에도
不拘하고 現在 其 術後感染は 基本的 問題点이 되는 것이다. 이로 하여 同型 股関節再
手術의 경우 其 術後感染 문제로 後悔된 文献에 의하면 初期試験에 比하여 높은 것으
로 알려져 있다. 股関節全置換術後 感染에 關한 問題는 Bachholz(1959)가 特殊
骨セメント(Palacos) 자체 各種 抗生剤を 混合使用으로서 好い 結果を 発表하였다.

4. 其他 研究된 各種 抗生剤의 重覆後 進出 有効期間에 對하여 記述하였으며 本症
例에 있어서도 抗菌剤을 引用하여 2'-Amino-2'-Deoxy-Kanamycine (KANENDO-
MYCIN)를 骨セメント 使用時 混合 使用하였다.
Fig. 1. Post-operative radiogram showing some rotation of the femoral head. Jewett nail is out of place with anterior in the femoral head.

Fig. 2. Tip of the Jewett nail is exposed in the antero-medial direction. Nail-plate junction in removed before attempting to break off head.

Fig. 3. Gross appearance of dead bone on the inner side of the femoral head during the biopsy.

Fig. 4. LFA of the right hip one year after nailing. No. 3 position for reattachment of the trochanter enhanced by springloaded wire. There is inevitably some proximal misplacement of the trochanter plate resulting from the use of a conventional wire tightener. Two broken screws are seen in the medullary canal of the femur. (Chisel struck like a chisel down the medullary canal procedure)