

## Chapter 4

# Clinical Results

*The clinical results of this operation are so good that one often feels they are too good to be true.*

The driving force behind the development of total hip arthroplasty was Charnley's desire to help patients disabled by painful arthritic hips. The surgical procedures available: intertrochanteric osteotomy, arthrodesis, or excision – pseudarthrosis – did not offer predictably significant clinical benefit; and if they did it was only limited and in a carefully selected minority.

It is interesting that pain, hip pain, the main indication for surgery, has received so little detailed attention. True enough, every assessment scoring system includes pain – even at times using visual analogue scale – but none define hip pain.

At some stage on the “patient pathway” and almost certainly very early on – and maybe even before the patient is seen – an assumption is made that the problem is “a painful hip”. Very often the radiograph is seen before the patient becomes the focus of attention.

Deep seated structures, when affected by a disease process, do not offer localising symptoms – certainly not initially. It is generally assumed that pain from an arthritic joint arises in the worn arthritic joint surfaces. After all, an intra-articular injection of local anaesthetic offers immediate relief of pain. What about the capsule? At some stage it was considered the source of pain and the cause of fixed deformities. Excision of the capsule has never been the part of the Charnley hip replacement, although some limited exposures did advocate the excision of the capsule.

The immediate relief of pain remains the driving force behind the surgery of total hip arthroplasty. The relief of pain is considered to be the success of the treatment offered. And yet, pain can only be experienced by the sufferer. Painful episodes cannot be quantified in terms that can be understood, compared with that of other sufferers or recorded in the memory for any future reference – a fortunate state for the human race.

Any attempt to assess, record, recall or compare the results of a treatment must understand and accept the limitations. In short – pain is personal and so is the relief from it.

In clinical practice where brevity, simplicity and comparability is essential; the d’Aubigne and Postel method of assessment [1] as modified by Charnley [2] continues to be most practical. Pain relief after successful THA has practical implications for follow-up. A natural symptomatic joint, replaced with a neuropathic spacer cannot become symptomatic unless the failure involves the living structures – a late and often very late state of affairs.

Activity level achieved as a result of a successful THA is not a characteristic of a particular design, material or even a method of component fixation – certainly not in the short term – it is a reflection of patient selection for the operation. Activity level advertises success, attracts would be candidates some of whom may have unreasonable expectations.

Single case success is attractive both clinically and commercially – a most unfortunate combination.

It is interesting how the range of hip movement has received little attention. Freedom from pain need not be accompanied by full range of hip movements except in very exceptional cases and situations.

In preoperative assessment, patient selection and identification of the source and severity of the problem is most essential. At follow-up comparison of serial radiographs is mandatory.

## Clinical Assessment

Successful clinical results uncovered the demand and extended the indications for the operation. Pressure of numbers and the increasing costs focused the attention on the financial implications. Initially the operation was used as a “unit of currency” against which the cost of other procedures was assessed. More recently the cost-benefit ratio, for individual patients, expressed as “quality of life”, is becoming the standard. This is not unexpected. Pain – hip pain – is not immediately obvious to an observer. Furthermore, severity of pain does not usually leave a permanent imprint on our memory – fortunately.

Restriction of movement or activity may be more obvious but only to those close by. Activity level, achieved as the result of freedom from pain, becomes clear for all to see without the need for explanation or comment.

Thus hip pain, the indication for the operation is quickly forgotten, while activity level advertises individual clinical success and becomes the target for would be patients to aim for.

The indications for the operation and the patients expectations have moved away from pain relief to expected activity level.

In clinical practice viewing of radiographs often comes before clinical assessment. In this context the term: “end-stage arthritis” is becoming common; a most

unfortunate development. It is not only unscientific but full of emotional overtones. History and examination must come first. A radiograph shows me what the hip looks like but the patient tells me what it feels like!

## *History*

Patients presenting for consideration of hip replacement surgery are often “self-selected” and maybe even “self referred.” They may already have a record of previous consultations. More often than not they may have preconceived ideas as to what benefits are to be had from a successful hip replacement. It has been observed over the past 40 years or so that the type of patient has gradually changed. In the 1970s patients often presented late in the disease process. Pain was often severe, disability great, deformities marked, dependence on sticks or crutches common. Then followed a period when patients presented with fears of “being confined to a wheelchair”. More recently high expectations are the order of the day. Why this changing pattern? Confidence and familiarity and unreasonable claims of success – often based on the very early “single case success stories” may be some of the reasons.

Detailed history is essential and must follow a clearly set pattern no matter that the problem and the decision as to treatment are immediately obvious. By the time the patient enters the consulting room every opportunity must be taken to establish a relationship which may be for a lifetime – either of each other or of the arthroplasty.

Time of onset and duration of symptoms, pain patterns, its effect on daily activities, patient’s understanding of the problem, but above all knowledge of the disease process, the likely progress and finally the ins and outs of surgery. After physical examination, then and only then, should the radiograph be viewed. It is not the purpose of this work to spell basic details of history taking and examination.

Young patient, long history, would suggest congenital problems. Female patient with restriction of all movements apart for flexion – probably protrusio. Muscular male with a history of sporting activity – could be slipped upper femoral epiphysis. Grumbling pain with full movements of the hip, be on the lookout for avascular necrosis. Sudden “collapse” rare – beware of something unusual or even sinister here, special investigations may be indicated.

Be on the lookout for leg length discrepancy. Disease process – other than protrusio or early AVN – should result in limb shortening. Apparent limb lengthening, of which the patient is invariably unaware, indicates early arthritis with a well preserved proximal lever, femoral head contained within the acetabulum.

Beware of fixed pelvic obliquity due to long standing spinal problems. All problems may not be solved by THA and leg lengthening after surgery will be bitterly complained of. First consultation need not lead to surgery.

A word of warning about a congenital dislocation of the hip with secondary degenerative changes, **adduction deformity** and symptoms severe enough to warrant surgery. The contralateral hip dysplasia may not be obvious because of the

pelvic obliquity. Successful hip replacement “uncovers” the dysplastic hip, arthritic changes – now symptomatic – may follow rather quickly. What must not be forgotten with limb length discrepancy is that the knee on the longer side functions in flexion, degenerative changes of the knee may follow. The knee on the side of the adducted hip functions in valgus. Levelling of the pelvis after THA exaggerates the valgus of the knee which makes walking difficult.

Pain severe enough may make or break an individual, yet how quickly it is forgotten. The hip joint so deeply seated has not often been studied as a source of pain. The patterns presented are so varied that an attempt was made to establish a more detailed description. The areas of the anatomy are shown in Fig. 4.1. It is this variable pattern, without sensory or neuromuscular involvement that is typical.

### ***Grading Method for Pain, Function and Movement in the Hip***

Charnley adopted the grading method of d’Aubigne and Postel (1954) [1] with modifications [2] to record pain, function and movement in the hip, both pre-operatively and at follow-up (Fig. 4.2, Table 4.1). The method is simple, clear, not time consuming but demands some clarification.

#### **Pain**

Assessment for pain is probably best carried out by comparison of the extremes:

Grades 1–6, 2–5 with the 3–4 “grey area” where significant nocturnal pain is prominent in grade 3.

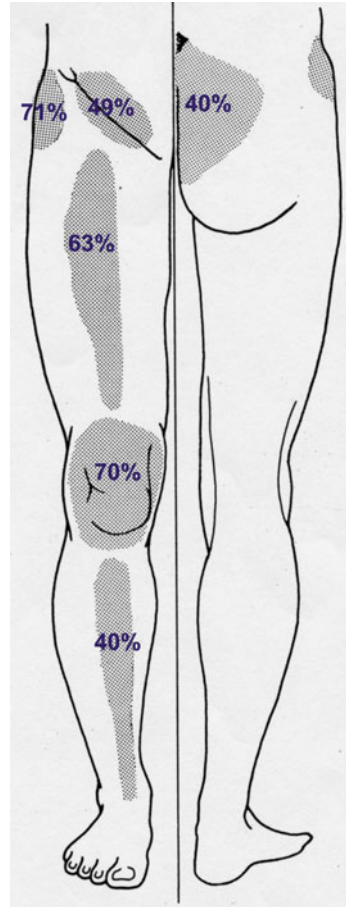
Grade 1 Severe spontaneous as in a fracture of the femoral neck, septic arthritis or some other more sinister pathology. Exceedingly rare in an arthritic hip. If genuinely so severe caution must be the byword – be aware and seek other problems to be addressed.

Grade 6 Completely pain free as in a normal hip or with an excellent result of hip replacement. It must not be forgotten that a very stiff or fused hip very often is painless.

Grade 2 Pain at rest or permitting limited activity with the use of support – a walking frame, sticks or crutches, with frequent resort to analgesics. Patients experience pain virtually all the time but the severity may vary becoming severe when precipitated by sudden movement when under load: as in getting up from a sitting position, turning, climbing stairs or stumbling. Not often seen in more recent years: patients usually present much earlier.

Grade 5 No more than an occasional discomfort, settles quickly with rest, analgesics not usually taken except very occasionally. Can be regarded, and often is, as

**Fig. 4.1** Distribution of pain referral areas of the anatomy



a satisfactory result of total hip arthroplasty. If presenting as symptoms of early arthritis, in the hope to achieve some unreasonable level of activity after hip replacement, caution is the watchword – possible complications must be balanced against “moving up a grade”.

The 3/4 grades present the dividing line.

Grade 3 Probably the most common grade presenting for hip replacement. Being significant pain at rest – especially nocturnal. May be gleaned from the patients demeanour when giving the history: pain alters the face especially around the eyes and wipes out the sense of humour. It is the combination of pain, fear of sudden severe episodes of pain and deprivation of sleep that becomes an absolute indication for hip replacement.

Grade 4 This may be considered as a borderline situation though clearly other factors must be taken into consideration. No night and only minimal rest pain. It is

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|                        |  |  |  |   |  |  |  |
|------------------------|--|--|--|---|--|--|--|
| Surname                |  | Christian Name                             |  | Age   |  | Wgt. No  |  |
|                        |  |  |  |   |  | Date   |  |
| MONTHS SINCE OPERATION |  | NAT'LTY OF OPERATION                       |  |   |  |  |  |
| R                      |  | L  |  | R   |  | L  |  |
| Housework              |  | Evident                                    |  | Standing Light  |  | Heave Manual   |  |
|                        |  |  |  | Changed to Lighter  |  | Retired  |  |
| Climb                  |  | With difficulty                            |  | Climb   |  | With difficulty  |  |
| Yes                    |  | No   |  | Yes   |  | No   |  |
| Number of Pain Tablets |  | Spontaneous Pain at Night                  |  | Yes   |  | No   |  |
|                        |  |  |  | Yes   |  | No   |  |
| Severely               |  | Two sticks                                 |  | Two sticks  |  | One stick  |  |
| 1                      |  | 2  |  | 3   |  | 4  |  |
| PAIN                   |  | Severe Spontaneous                         |  | Severe on attempting to walk. Prevents all activity   |  | Pain tolerable permitting limited activity   |  |
|                        |  |  |  | Pain only after some activity. Disappears quickly with rest.  |  | Slight or intermittent. Pain on standing for each leg - getting less with normal activity. |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| WALK                   |  | Tolerable with one stick or without sticks |  | Limited with one stick (less than one hour). Difficult without stick. Able to stand for long periods. |  | Long distance with one stick. Limited without it.  |  |
|                        |  |  |  |   |  | No stick but a limp.   |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| Gait                   |  | Normal                                     |  | Walks with moderate limp  |  | Slight limp  |  |
| WALK                   |  | Normal                                     |  | Normal  |  | Normal   |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| FLEXION                |  | Ankylosis                                  |  | Ankylosis   |  | Ankylosis  |  |
|                        |  | Contracture                                |  | Contracture   |  | Contracture  |  |
|                        |  | Spasm                                      |  | Spasm   |  | Spasm  |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| ABDUCTION              |  | Ankylosis                                  |  | Ankylosis   |  | Ankylosis  |  |
|                        |  | Contracture                                |  | Contracture   |  | Contracture  |  |
|                        |  | Spasm                                      |  | Spasm   |  | Spasm  |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |
| R                      |  | L  |  | R   |  | L  |  |

ROTATION

R Ankylosis Contracture L Ankylosis Contracture

KNEE RANGE

R degrees

L degrees

ABDUCTION AGAINST GRAVITY

R degrees

L degrees

STRAIGHT LEG RAISING

R degrees

L degrees

TRENKLEBERG

R L

APPARENT SHORTENING

R inches

L inches

TRUE SHORTENING

R inches

L inches

LIMP

SHORT LEG LIMP YES NO

HIP LIMP YES NO

SOUND ANKYLOSIS

FIBROUS JOG

CATEGORY 'C' CASES

C.V.S.

RESPIRATORY

NEUROLOGICAL

OTHER CAUSES

SENILITY

OBESITY

PSYCHIATRIC

MISCELLANEOUS NATURE OF

COMMENTS

R L

NUMERIC CLASSIFICATION

|        |     |     |     |     |    |   |
|--------|-----|-----|-----|-----|----|---|
| TOTALS | 250 | 210 | 150 | 100 | 50 | 0 |
| GRADE  | 4   | 3   | 2   | 1   | 0  |   |

Initials of Examiner

Fig. 4.2 Green Card – Charnley clinical assessment chart

Table 4.1 Charnley clinical assessment chart

| Grade | Pain  | Function (activity)  | Movement (Total range) |
|-------|---|--|------------------------|
| 1     | Severe Spontaneous                                  | Few yards or bedridden<br>Two sticks or crutches   | 0–30°                  |
| 2     | Severe on attempting walking. Prevents all activity | Time and distance very limited with or without support                                     | 60°                    |
| 3     | Tolerable permitting limited Activity. Pain at rest | Limited with support, difficult without support. Able to stand for relatively long periods | 100°                   |
| 4     | On activity settles with rest                       | Long distance with one stick<br>Limited without it   | 160°                   |
| 5     | Slight, intermittent, improves with activity        | No stick but limp  | 210°                   |
| 6     | Pain free   | Normal   | 260°                   |

this group of patients that need more time in a consultation and a single consultation may not be sufficient to make the decision. Fear of loss of independence of being confined to a wheelchair (somehow the notion of cripples and wheelchairs remains ingrained) and somehow missing an opportunity of a successful treatment is often at the back of a patients mind.

Having obtained the history and confirmed the findings on examination, and having explained the radiographic appearances, the need is to explain the pattern into which the whole picture fits. Patients have no maps or charts against which to place themselves or their hip problems. We all tend to selectively pick out what we want to hear, or accept only the result that would be in our interest, there must be something of an optimistic gambler in us all.

Time spent on a consultation, especially the first one, is never and should never be wasted. A good rapport becomes even more important years later.

## **Function/Activity**

Assessment of function before, and even more so after hip replacement is a very complex task and no method can be satisfactory to all. Attempts have been made to bring in various activities as an aid in assessing this parameter. The best example of complexity of the subject can be seen when contemplating the Olympic Games: numerous disciplines, numerous competitors, fractions of units separating competitors, only one winner – yet each one attempting to assess “activity”. How can a clinician attempt to define or describe and put on record details for an individual patient? It cannot be some rigid system, divorced from the individual, or based on some arbitrary scale. Function is personal to the individual. It cannot and must not be a desire for some unfulfilled expectations from the past or hopes for the future. It is here that the guiding role of the surgeon is so important. A balance must be struck between what is possible, desirable and what can be achieved – barring complications. Temptation of extrapolating from the last successful case must be tempered with caution.

### Grades 1–6

Grade 1 Confined to bed, wheelchair, certainly confined and housebound. Very dependent on others for activities even in and around the house. Unusual with just a single arthritic hip, most likely with multiple joints being involved e.g. rheumatoid arthritis.

Grade 6 Normal for age and gender which clearly is a vast range, not only of abilities, but also of needs and expectations

Grade 2 Permitting limited, independent activity, slow with difficulty and with support.

Grade 5 Just short of normal, yet very good. This grade and limit gradually creeps up on all of us. It is here that a sudden burst of activity may lead to undesirable consequences. Acceptable result of THA though at times may not be quite what the patient expected or the surgeon was hoping for. This group of patients like grade 4 may be possible to identify before surgery.

Grade 4 Mobile, even a relatively good walking distance, but a limp and use of support – a stick or a single crutch is required when outdoors. Reasonable result of THA if pain is completely relieved otherwise not a happy state of affairs.

Grade 3 Severely limited but capable of some independent outdoor activities although always in need of support. May be a good guide for the acceptance for THA but not a good result of the failed operation. If pain is relieved, as at times following removal of the artificial joint, that limitation of activities may just be accepted even if not exactly acceptable.

Grading of activity both before and after surgery may at times include daily activities common to all, or specific to the individual patient. The list can be expanded or limited but should include activities common to all of us i.e. dressing, undressing, walking, climbing stairs, hygiene or even recreational activities such as distance walking, dancing or some sporting activities. (This last group brings us closer to the Olympic Games issues).

### **Range of Hip Movements**

This was recorded by charting the position of the lower limb – with respect to the diagram – showing the range. Sum of all movements is then represented by a single number. Ankle separation, a very valuable parameter, was tape-measured. Although this parameter can be measured and recorded very objectively, the restrictions that loss of movement imposes on an individual may not be appreciated unless specific questions are posed. Again it centres around daily activities – here the ability to dress without hindrance – socks, shoes and toenails feature prominently. (Night time activities are not often mentioned in the context of hip movements).

### **Refinement of Assessment**

Assessment of a patient's activity level after THA may not possible if there are factors other than the hip that contribute to the disability. It is primarily for that reason that Charnley suggested the modification with the addition of the prefixes **A**, **B** or **C**.

**Prefix A:** Would indicate the patient with a unilateral hip problem with no other factors, mechanical or medical, that would affect mobility. This is the group that can be used for the purpose of assessing activity level after hip replacement.

**Prefix B:** Bilateral hip involvement in the disease process but no other factors affecting mobility.

**Prefix C:** Unilateral or bilateral hip involvement with other pathologies, mechanical or medical, affecting mobility. In this group would be patients with rheumatoid arthritis, cardiac or pulmonary problems, general debility or gross obesity. Under such circumstances pain relief and improvements in the range of movements would be possible to assess after surgery, but the operation, even if successful could not be used to assess improvement of function/activity.

In clinical practice a number of issues became apparent. Only patients in group **A** could provide a measure of success of the operation in terms of activity. In group **C** the only parameters that could be assessed was pain relief and range of movements



of the hip joint. Although individual patients were in a position to express their opinion in terms of improvement of function, their results could never match the patients in category **A**. Patients in category **B**, and with bilateral hip arthroplasties, hopefully successful, could gauge the level of improvement in function but only against their previous level.

No patient could be upgraded to the level above their original grade, no matter how successful the hip replacement had been. With time there would be an expected reduction in the numbers in category **A** and an increase in the categories **B** and **C**.

Increasing follow-up would also expose the arthroplasty, in the **A** category patients, to the highest activity level. Thus, any attempt to assess the results would have to take these aspects into consideration.

When assessing the long-term results it is very interesting to observe changing patterns. Reduction in the percentage in the group **A** and increase in the group **B** clearly indicates the increasing numbers of patients having bilateral THA. Change from **A** and **B** to **C** group would indicate an increasing proportion of patients with multiple disabilities - making general statements concerning assessment of function less valuable.

This relatively simple and easy to follow system has advantages which may not be immediately obvious. The visual scale, the movement, hopefully from low to high figures is an easy to understand scale and an excellent mode to break down the problem into three understandable parameters – accepting that assessing function will always be subjective and more likely for anecdotal presentation being taken advantage of.

The drawbacks of the classification. No indication is given of fixed deformities or whether the problem is bilateral hip disease, or arthroplasties, or indeed, a mixture of both.

Because of the large numbers of patients undergoing hip replacement it was considered, correctly, that compliance with any method of assessment and documentation would be inversely proportional to its complexity. The d'Aubigne and Postel system [1] as modified by Lazansky and Charnley [2] became the standard. In time, with increasing follow-up and experience, there arose a need to expand the methods of assessment of functional results. The advent of sophisticated methods of measuring wear – as in joint simulators – stimulated research in an attempt to bring the clinical and experimental methods closer for the purpose of comparison. If patients' activity levels could be expressed in purely mechanical parameters, as used experimentally, then testing of new materials could be carried out, at least initially, without the need for patient involvement.

Other methods of assessment are frequently being used. Complexity may imply quality but percentage figures do not convey the percentage of which parameter. In the same context "quality of life" comes into prominence. This parameter, although often quoted in an affluent society, has no great value in the context of clinical result. In fact, it can be argued, that with some communities starving while others watch commercials advertising low-calorie diets, 'quality of life' measures are best avoided.

Although pre and post-operative detailed assessment and recording are essential and form a part of good clinical practice, it must be pointed out that any method may

become a measure of patient selection and not a measure of the result of the operation. THA is such a consistently excellent procedure that what is being assessed is whether the indications for selecting the patient were adequate.

With increasing follow-up clinical assessment loses its importance – except for the patients with the longest and ever increasing follow-up. The patterns of failure pave the way for evidence based improvements. We must distinguish between clinical success of the operation for an individual patient and the long-term success of the method.

## References

1. d'Aubigne MR, Postel M. Functional results of hip arthroplasty with acrylic prosthesis. *J Bone Joint Surg (Am)*. 1954;36-A:451–75.
2. Charnley J. The long-term results of low-friction arthroplasty of the hip as primary intervention. *J Bone Joint Surg*. 1972;54-B:61–76.