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Original Research Paper

Orthopaedics

"DETERMINE THE ROLE OF PLASTER OF PARIS CAST IMMOBILIZATION OF SKELETAL PIN FOLLOWING SKELETAL TRACTION"

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ABSTRACT

BACKGROUND: Application of skeletal traction, requires insertion of skeletal pin which inflicts an open skin wound around the pin, impending portal for entry of microbes into the pin tract. Associated notable complications are metal reactions and secondary infection, subsequently leads to pin change or removal, failure of fracture union, septic arthritis, osteomyelitis etc. Aim of the present study was to compare the pin tract infection grade of elderly patients having open pins with antiseptic dressing and cases immobilized with plaster of Paris (POP) cast.

MATERIALS AND METHODS: The study population consists of 88 patients treated with upper tibial skeletal traction, of whom 44 persons followed up by regular antiseptic dressing of open percutaneous pin would (Group 1) and the rest 44 persons having pin covered with POP cast (Group 2). Pin tracts of both groups were evaluated after 6 weeks by Checketts-Otterburn's grading system. Primary outcome variables of infection gradation and outcome measures was compared by NNT with 95% confidence interval, proportion and percentage.

RESULTS: Mean age of patients of group 1 was 69.75, SD 7.185 and group 2 was 68.95, SD 8.177. Skeletal pin had to be removed (Grade 4 in Checketts-Otterburn's grading system) in 10 (66.7%) of group 1 compared to only 5 (33.3%) cases of group 2. No case of osteomyelitis (Grade 6) has been seen in any group. The difference in grade of pin tract infection in the two groups was statistically significant (p =0.001).

CONCLUSION: High morbidity in conservative treatment is vastly the result of continuous pain, infection and discomfort. The present study compellingly documented non-operative management by skeletal traction is far from being the lethal procedure if the the rate of pin tract infection is reduced by covering with POP cast. In institutes that cater to a significant number of elderly population, skeletal traction with appropriate control of pin site infection is an effective alternative to more aggressive operative method.

KEYWORDS : Skeletal Traction, Pin Tract Infection, Plaster of Paris (Pop) Cast.

INTRODUCTION

Skeletal traction (Also referred to as distraction), is one of the most ancient (As well as one of the most modern) medical treatments known. A percutaneous skeletal pin is a metal pin (Usually stainless steel) which has been inserted across the bone and protruding through the skin, opposite. The insertion of skeletal pin involves inflicting a wound to the skin. The open wound around the pin is a potential portal for entry of bacteria into the pin tract. Common complications associated with their use are metal reactions and secondary infection.

In addition to being physically and psychologically distressing, this can lead to complications such as chronic osteomyelitis, delayed fracture healing, and increased length of hospital stay or hospital readmission.[1] These complications related to pin tract resulting in need for pin change or removal, failure of fracture union, septic arthritis, osteomyelitis and even infective endocarditis in some instances.

The purpose of this study is to review techniques of optimizing the interface between the bone and pin in skeletal tractions thereby minimizing pin infection and loosening.

The present study has compared the pin tract infection grade of open pins on regular antiseptic dressing against those immobilized with plaster of Paris (POP) cast.

MATERIALS AND METHODS

The present study was conducted at the department of Orthopaedics of Darbhanga medical college and Hospital Darbhanga Laheriasarai Bihar. The institution is the lone referral center of patients In addition the hospital also serves people of a vast geographic area including surrounding states like Bihar, Jharkhand ,UP.

The study population consists of skeletally matured patients undergoing upper tibial skeletal traction at the department of Orthopaedics DMCH during the study period of one year for various clinical indications.

Inclusion criteria of the present study was skeletally mature patient of 7th to 8th decade admitted with hip pathologies, closed fractures of femur or pelvis in the orthopaedic department, DMCH and treated with upper tibial skeletal traction. Cases with traction pin inserted in emergency operation theatre at the DMCH with similar type of pin (4.0 mm Steinmann pin) insertion by a hand held manual drill were also included in the study group.

Patients having diabetes mellitus, evidences of other source of infection in the body and who were immunocompromised were excluded from the study. The sample size were determined by presuming the effectiveness of POP cast immobilization over conventional dressing and the difference between these two as 30% to be clinically relevant, with a power of 80% (β=0.2) at 0.05 level of significance (α=0.05) ; therefore sample size was calculated 40 in each group.

For considering the chance of possible dropouts 10% total 44+44=88 patients was included in the study. Therefore 44 persons with pin left open percutaneously with regular antiseptic dressing and 44 persons having pin covered with POP cast were included in the study. The study had been conducted after obtaining permission from departmental committee, scientific review committee and institutional ethics committee. Written informed consent had been acquired from all patients for the present study.

Patients had been chosen randomly during the study period and grouped as Group 1 having Steinmann pin left open with regular antiseptic dressing with surgical spirit soaked gauze pieces twice daily and Group 2 where the pin was covered with POP cast and has been carefully followed up.

Following pin insertion oral antibiotic (Cefuroxime 500 twice daily) was given to both groups for 5 days. Both groups of patients were followed up for 6 weeks. Patients were carefully interrogated and examined for evidences of pin tract infection at 6 weeks by observing the following: erythema and induration, discharge from pin tract, pain/tenderness at pin site, loosening of pin and fever more than 101.5ºF. Accordingly all cases were categorized by Checketts-Otterburn's grading system[2] (Table1).

All data further calculated using Microsoft Excel and analysed in IBM SPSS 20 (Chicago Inc.) Primary outcome variables of infection gradation and outcome measures of these groups was compared by NNT with 95% confidence interval, proportion and percentage.

RESULTS

A total of 88 patients were included in the study and grouped in two. Eight patients, 4 of each group were excluded from study as 6 pins had to remove before 6 weeks (Checketts-Otterburn's grade 4 or more) and 2 left hospital before study period.

Mean age of patients of Group 1 was 69.75, SD 7.185 and group 2 was 68.95, SD 8.177. Male: Female ratio in Group 1 was 2.33:1 whereas it was 1.10 for Group 2. The p value for this observation was 0.529 and hence the difference was not significant.

After 6 weeks of follow up of both groups pin tracts were graded by Checketts-Otterburn's grading system. [2] (Table 2). A total of 15 skeletal pin had to be removed at 6 week (Grade 4), 10 (66.7%) of them were in Group 1 whereas only 5 (33.3%) cases were of Group 2 with plaster of Paris cast immobilization.

No case of osteomyelitis (Grade 6) has been seen in any group. In Chi-square test, value of $\chi 2$ was 13.830, and as the present had a predetermined alpha level of significance (α) was 0.05, p value was calculated to be 0.001. Since the p value of 0.001 was lesser than the conventionally accepted significance level of 0.05 (i.e. $p<0.05$) it was established that there is statistically significant reduction in grade of pin tract infection in patients with pin immobilized by POP cast (Group 2) in comparison with cases with open skeletal pin wound managed by regular antiseptic dressing (Group 1).

Grade	Grade Appearance
1	Slight redness, little discharge
2	Redness of skin, discharge, pain, and tenderness in the soft tissues
3	Grade 2 but not improved with antibiotic.
4	Severe soft tissue infection involving pin, sometimes with associated loosening of the pin
5	Grade 4 but also involvement of the bone; also visible on radiographs
6	This infection occurs after pin removal. The pin track heals initially but will break down and discharge in Intervals. Radiograph shows new bone formation and sometimes sequestra.

Table 1: Checketts-Otterburn's Grading System

Group	Follow up at 6th week			Total
	Grade 2	Grade 3	Grade 4	
1	4	26	10	40
	17.4%	61.9%	66.7%	50.0%
2	19	16	5	40
	82.6%	38.1%	33.3%	50.0%
Total	23	42	15	80
	100.0%	100.0%	100.0%	100.0%

Table 2: Checketts-Otterburn's Grade after 6 weeks of skeletal pin insertion in both Group1 and Group 2

DISCUSSION

Definition of pin site infection remains a problematic issue. As noted, the studies used various methods to determine that patients had pin site infections. The panel was split almost evenly around the value of using a classification system to define infections. Those disinclined to using a clinical classification system noted the lack of established validity and reliability and the fact that grade 1 in both systems may just be local inflammation.

Mahan et al. [3] found a correlation between loosening of pins and pin-track inflammation, and it is generally accepted that looseness increases the risk of infection. Hydroxyapatite-coated pins undergo osseointegration, and in theory, this should decrease the risk of infection. [4] The duration of postoperative prophylactic treatment with antibiotics appears to be important. In their study, a period of two weeks proved to be the most effective.

Regarding pin tract infection control there have been quite few studies in the past comparing various method of pin site dressing, various ingredients and cleansing solution and various modifications in hardware system. However most of these studies were upon external fixation pins used in damage control orthopaedics or in limb lengthening procedures.

Because of the availability of varied internal fixation devices there are only few indications for treating fractures with upper tibial skeletal traction: for e.g.:*nonambulatory or chronic dementia patients,* terminal disease with less than 6 weeks life expected,* unresolvable medical comorbidities that preclude surgical treatment and* active infectious disease that preclude insertion of a surgical implant.[5] Also there is increasing incidence of open fracture following increasing incidence of road traffic accidents with high velocity trauma leading to increased use of external fixation systems.

Consequently, there are only few studies on skeletal pin use for the purpose of skeletal traction in recently added literature. Most of the studies on pin tract infection and its controlling is on external fixation systems. High energy open fractures are often initially treated with external fixation followed by subsequent internal stabilization.

Bruce H. Ziran concluded in his study that skin stabilization alone around external fixator pins, without mechanical or chemical treatment, would result in low pin-tract problems. Our study was similar in respect to skin stability hypothesis, but on skeletal traction pin of proximal tibia by plaster cast immobilization. We found the method clinically significant in decreasing the grade of pin tract infection.

Reported rates of pin complications range from 7.9%.[8] to 100%.[9,10] partly due to the lack of a uniform definition and classification system to determine and quantify pin tract infection.[11] Different research methodologies and classification criteria make accurate comparisons of interventions difficult to interpret and relate to clinical practice.

Erratic documentation of pin site infection and pin site care within the literature, along with consideration of too many variables, or failure to include control groups within studies makes further identification of successful actions difficult. This not only restricts translation of research findings in to practice, but hinders progression of evidenced based care within this area.Tools for identifying pin site infection (Dahl. [12] Patterson. [13] Saleh and Scott. Clint et al. are not shown to be valid or reliable since these cannot be tested for diagnostic accuracy, as there is no gold standard diagnostic test against which to compare it. These existing tools are mostly based on

health professional generated data and not patient-orientated data about symptoms.

A lack of clear evidence and consensus within the literature has resulted in inconsistent pin site management and the subsequent failure to prevent or reduce the risk of quantifying pin tract infection on a regular basis. A key step to preventing quantifying pin tract infection is to prevent bacterial colonisation of the pins and wires in a manner which is effective and acceptable to both clinicians and patients.

CONCLUSION

The present study convincingly confirmed that used in the manner as described, the comfort of these aged patients is quite surprising. Non-operative management by skeletal traction is far from being the lethal procedure as it was believed, if the pin wound is properly managed as done in the study by covering with POP cast to reduce the occurrence of pin tract infection.

High morbidity associated with conservative treatment is vastly the result of continuous pain, infection and discomfort which wears out these old people. On skeletal traction with support of modern user friendly analgesics these elderly patients become happy and correspondingly their health improves.

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