Introduction

Epineural Repair Technique and Long – Term Results :

This study carried out on 20 patients complaining of acute sciatic nerve injury as a result of shell and bullet injuries from January 2002 – September 2007, they underwent surgical intervention for sciatic nerve exploration 5 – 8 months post injury. The purpose of all nerve repair techniques is to restore continuity of the nerve trunk, including all of its elements in order to achieve optimal and useful reinnervation of both sensory and motor end organs. There are many accepted techniques for coaptation of the ends of a severed nerve. No single repair method is appropriate for every instance of nerve injury. The choice of repair technique depends on several overriding anatomical factors [2].

The following grading system used in the evaluation of acute nerve injury

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>M5</td>
<td>complete recovery</td>
</tr>
<tr>
<td>M4</td>
<td>All synergetic and independent movements are possible</td>
</tr>
<tr>
<td>M3</td>
<td>All important muscles act against resistance</td>
</tr>
<tr>
<td>M2</td>
<td>Return of perceptible contractions in both proximal and distal muscles</td>
</tr>
<tr>
<td>M1</td>
<td>Return of perceptible contractions in proximal muscles</td>
</tr>
</tbody>
</table>

Evaluation of Epineural Repair of Acute Sciatic Nerve Injury

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No contraction
From Sedon H): Surgical Disorders of the peripheral nerves, 2nd ed.
Edinburgh, Churchill

British Medical Research Council system of assessment of sensory Recovery
Grade Description
S4 complete recovery
S3+ some recovery of two point discrimination
Within the autonomous area
S3 return of superficial cutaneous pain and tactile sensitivity throughout the cutaneous area with disappearance of any previous overreaction
S2 return of some degree of superficial cutaneous pain and tactile sensibility within the autonomous area of the nerve
S1 recovery of deep cutaneous pain sensibility within the autonomous area of the nerve
S0 Absence of sensibility in the autonomous area

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Clinically :
Patients with acute peripheral nerve injury usually have nerve conduction defects that can manifest as motor or sensory dysfunction[5]. Acute nerve injury can cause temporary or persisting paralysis [1]. The sensory component and motor component must be evaluated separately to ensure accurate diagnosis. In some cases, the injury does not match the clinical presentation. Operative findings of nerve injury may or may not match clinical findings.

Data exist of gross operative evidence of nerve injury without clinical evidence of neurological dysfunction, such as with sheath hematoma and compression by fracture fragments. Conversely, data exist of intraoperative grossly normal appearing nerves with clinical paresis [1]. These deficits may develop after initially appearing with a normal neurological examination [2]. More specifically, following a traumatic hip dislocation, some patients may develop sciatic nerve deficits even after an initial normal neurological examination [1] hence, when a nerve is damaged, it may continue to appear normal in a neurological examination. In truth damage can be revealed only through diagnostic studies.

In many instances, acute nerve injury associated with complex trauma complicates a thorough neurological examination.

In many patients, nerve injury may remain undetected because joint and/or bony injury may dominate the clinical picture [5]. Nerve injury may be apparent immediately after injury. For example, immediate paralysis of common peroneal nerve and foot drop with loss of eversion of the foot usually are reported at the time of a stretch/contusion injury without fracture or dislocation at the knee level [4]. Epineural repair is enhanced with the use of magnification either with magnifying loupes or the operating microscope.

In accomplishing the primary epineural suture technique, the
surgeon first divides the nerve ends proximal and distal to the injury site until all visible signs of damage have been debrided, fascicles then mushroom from the neural stumps, and the epineurium retracts slightly. The sutures are placed in the external epineurium using non-absorbable sutures. Usually 8–0 nylon is used for sciatic nerve injury repair. The nylon is placed through the epineurium proximally and distally, and tied. The epineurium is not closed so tightly that the fascicular ends become mismatched and malaligned by bunching up. It is preferable to leave a small gap in the epineurium held together by a small suture with the fascicular ends in more appropriate alignment. Therefore the suture which is not tied tightly, acts as the guiding suture rather than a retention suture. The second suture is placed opposite the first and then the epineurium is closed by halving the distance on the anterior and posterior of the nerve. If the nerve can not be approximated with 8–0 nylon suture, tension is considered excessive and further mobilization or nerve grafting should be performed.[2] Epineural repair is strong and tension-resistant [7]

**Materials and Methods**

This study carried on 20 patients complaining of acute sciatic nerve injury as a result of shell and bullet injuries. from January 2002 – September 2007, they underwent surgical intervention for sciatic nerve exploration 5 – 8 months post injury. Preoperatively they were fully investigated taking in consideration the time of injury and the level of injury, and clinical findings and the motor and sensory deficit. We mainly depend upon the tenile sign and EMG and nerve conducting study finding in evaluation of the nerve status preoperatively and the same parameters were used for postoperative evaluation. The epineural suture technique was used in all the cases under loup magnification or operative microscope. Both direct nerve repair and nerve grafting were used in our study depending upon the gap created by the injury itself or by the excision of neuroma during the preparation of the proximal or distal nerve stumps.

**Table 1** details of materials and methods.

<table>
<thead>
<tr>
<th>Age of the patient</th>
<th>8–60 years</th>
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<tbody>
<tr>
<td>Sex of the patient</td>
<td>Male 17</td>
</tr>
<tr>
<td></td>
<td>Female 3</td>
</tr>
<tr>
<td>Level of injury</td>
<td>15 middle and lower third</td>
</tr>
<tr>
<td></td>
<td>5 upper third and gluteal reagon</td>
</tr>
<tr>
<td>Severity of injury</td>
<td>20 cases</td>
</tr>
<tr>
<td>The nerve injured</td>
<td>12 cases</td>
</tr>
<tr>
<td>C.P.N.</td>
<td>7 cases</td>
</tr>
<tr>
<td>P.T.N.</td>
<td>5 cases</td>
</tr>
<tr>
<td>Both</td>
<td></td>
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</table>
Direct repair  
Nerve graft  
( The gap )  

| 15 cases |
| 5 cases |
| 4 – 10 cm |

**Figure 1**  neuroma at the site of nerve injury prior to it’s excision .

- Mobilization of the nerve used in most of the cases of direct repair with placing the joints in flexion position for a period of time using backslabs for this purpose .

**Figure 2**  direct epineural repair of sciatic nerve

**Figure 3** The way of application of back slab with certain degree of knee flexion to minimize tension at the repair site .

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8 – 0 nylon suture was used in all our cases for coaptation and the number of stitches varies from case to case according to the diameter of the nerve. Both common peroneal nerve (C.P.N.) and posterior tibial nerve (P.T.N.) were dealt with in our study aiming sensory improvement at the soles and correction of foot drop. Sural nerve used as a graft in all our cases who needed nerve grafting. Pneumatic tourniquet used in some cases with low level nerve injuries. Blood prepared in all our cases who were all underwent surgical repair under general anesthesia.

- Stitches were removed 14 days postoperatively and the backslab maintained for 6 weeks, taking in consideration the degree of the knee joint flexion which we gradually decreased 2 weeks postoperatively.
- We followed up our patients with tenile's test and EMG and NCS in 1 month interval.

Results
After 8 - 12 months of follow up :
- Sensory improvement े  protective sensation
- Motor improvement े  regain of dorsiflexion and planterflexion of the foot
- Progression in tenile sign 2 months postoperatively .
- EMG and NCS changes 4 months postoperatively .

<table>
<thead>
<tr>
<th>Postoperatively</th>
<th>-</th>
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<tbody>
<tr>
<td>Motor improvement</td>
<td>- 12 cases</td>
</tr>
<tr>
<td>Sensory improvement</td>
<td>- 13 cases</td>
</tr>
<tr>
<td>Partial improvement</td>
<td>- 7 nerves</td>
</tr>
</tbody>
</table>

- Table ( 2 ) post operative results .
- Evaluation of Motor Function improvement
- Total No. 12 , Grade M5 - 2 , M4 – 2 , M3 – 5 , M2 – 3
- Evaluation of Sensory Function improvement
- Total No. 13 . Grade S3+ - 2 , S3 – 3 , S2 – 5 , S1 – 3

Discussion
The use of magnification in nerve repair makes the results of surgery much more encouraging taking in consideration the level and the type of injury and the time elapse after injury .

As in other studies the age of patients affected by shell injuries the younger age group is more affected , and the male to female ratio is approximately 4 – 1 the same as other studies.
- Regarding the duration of the nerve injury and the time of repair as in other studies the intervention 3 – 4 months post injury has a better result than later repair.
- The more proximal the level of nerve injury the less is the outcome of repair as in other studies.
- Motor function improvement is less than sensory improvement and this is goes with the fact that the time of repair is greatly affect the motor function if performed 3 – 5 months post injury, while the time of repair is opened for sensory status improvement.
- The cases that showed partial improvement were the cases dealt with by nerve grafting and these results goes with results of nerve grafting in other studies.

**Conclusion**

No breakthroughs are at hand in the treatment of peripheral nerve injuries, but a number of things can be done to optimize the outcome.

1 - in contused nerves, repair should not be undertaken for three months from the time of injury. Further more passage of time, however, reduces the possible benefits, and there is no place for exploration after 12 - 14 months have elapsed since the injury
2 - Recent developments have improved the outcome. The operating microscope and micro instrumentation facilitate the performance of more precise nerve repair.
3 - Epineural repair is easy and effective method of nerve repair.

**References**

6 – Seddon HJ. Surgical disorders of the peripheral nerves. 2nd ed. Edinburgh, churchil Livingstone. 1975