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Conservative versus Surgical Management of Post-injection Sciatic Nerve Injury in Children

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Abstract

Background Data: Intramuscular injection in the gluteal region represents one of the most important causes of sciatic nerve palsy. The main manifestation of most patients is foot drop and/or sciatic pain**.**

Purpose: to evaluate the role of surgical exploration of post-injection sciatic nerve injury in reference to conservative treatment.

Study Design: A retrospective cohort study.

Patients and Methods: Reviewing our hospital medical records revealed 16 children with post injection sciatic nerve injury. All were included in this study. The mean age was 4.35±1.98 with range 1.5-8 years. Five children (31.3%) were females and 11 (68.8%) were males. All diagnosed by history, clinical examination, electrophysiological, functional assessment. All failed conservative treatment for 3 month and then either allocated for surgical exploration (N=10) or further conservative management (N=6) based on patients' choice. All were followed routinely clinically and electrophysiologically.

Results: Group I underwent surgical exploration and group II treated conservatively. The 3 months post-injection data were homogenous in both groups. Vasomotor changes, sensory loss and foot drop were the commonest manifestations in the 2 groups; right foot drop was more common than the left one (13 versus 3 children). Antibiotics and analgesics were the commonest causative agents of nerve injury in the studied children. Initial EMG were done for all cases at initial presentation and revealed sciatic nerve injury with complete degeneration of common peroneal nerve. Surgical exploration revealed peri-neural adhesions in all children. Follow up EMG at 3, 6 and 12 months shown complete improvement in 8 cases, partial improvement in one case and no improvement in one case in group-I. In group-II there was no reported improvement in 4 and partial improvement in 2 children with significant difference between the two groups (P=0.011).

Conclusion: Surgical exploration of post injection sciatic nerve injury in children is feasible and effective management in reference to conservative methods. (2017ESJ142)

Keywords: Sciatic nerve injury, surgical exploration, conservative management, intragluteal injection

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Introduction

Intramuscular injection is considered one of the most common causes of sciatic nerve injury. There are factors helping sciatic nerve injury; the site of needle (located medial and inferior to the upper outer quadrant of the buttock), the thickness of subcutaneous tissue, gluteal musculature in child, and old age.[9] The post injection sciatic nerve injury can result from allergic reactions, direct needle trauma, neuronal ischemia and secondary constriction by fibrosis. Common medications as antibiotics, analgesics are accused.[4] The peroneal division of the sciatic nerve is affected than the tibial division due to its more lateral position, little protective connective tissues, and the relative tethering of its course. The common presentation of sciatic nerve injury includes severe radicular pain and paresthesia with variable motor and sensory deficits.[19] There are factors that influence the prognosis of nerve recovery such as age of patient, level of injury, associated lesions, surgical procedure and its timing. The time interval between injury and surgery proved to be the most important factors for restoration of nerve function.[12,17,18]

The present study aimed to evaluate the role of surgical exploration of post injection sciatic nerve injury in reference to the usual conservative treatment in children.

Patients and Methods

This study was conducted on 16 children with post-injection sciatic nerve palsy treated at the Neurosurgery and Pediatric Departments, Faculty of Medicine, Tanta University. The age ranged from 1.5 to 8 years old. Children were followed up for one year after treatment. All patients initially were treated conservatively for the first 3 months, and then divided to two groups based on patients' family choice. Group-I (N=10) underwent surgical exploration at this point and group-II (N=6) preferred to continue conservative medical treatment after full explanation of the bros and cons to their family. Both groups were submitted for physiotherapy (electrotherapy for muscle stimulation, superficial heat, massage and exercise) assisted devices for one year which was the study duration.

All patients were evaluated by history taking (age, sex, causative drugs), neurological examination according to the nerve committee of the British Medical Research Council,[8] electrophysiological study (nerve conduction velocity NCV, electromyography of the sciatic nerve, and both common peroneal) at initial presentation, 3 months, 6 months and 12 months of follow up.

Surgical Technique:

We adopted the Infra-gluteal approach (Figure 1,2) in our study.[6,10] After intubation and induction of general anesthesia, patients were positioned prone. A curvilinear incision in a reverse question mark shape was fashioned. The incision follows the lateral aspect of buttock superiorly along the gluteal crease and inferiorly along the mid line of the thigh. Skin and subcutaneous tissue divided, the gluteus maximus become visible. The most inferior edge of the muscle should be identified for locating sciatic nerve. At mid line of thigh, the plane between long head of biceps and inferior edge of gluteus maximus was being developed just to identify sciatic nerve within the fat pad. Moving proximally, we divided about 3 cm of the gluteus maximus with assisted retraction from more proximal exposure of sciatic nerve. At this stage we start external neurolysis until sciatic notch. With caution during dissection to avoid injury of post femoral cutaneous nerve, blunt dissection is mandatory near sciatic notch to avoid injury of inferior gluteal artery.

After external neurolysis, fat graft and local steroids placed in the operative bed to prevent re-adhesion. Re-approximation of the gluteus maximus and closure of the wound were performed. After surgical procedure, patients received medications in the form of neurotropic drugs and underwent physiotherapy. These medical regimens were applied to both groups.

Partial improvement defined as: clinically grade 1 to 3 motor powers and EMG results is starting signs of re-innervation for the motor units and nerve conduction. Complete improvement defined as: clinically grade 4 and 5 motor power and EMG parameters of motor units and nerve conduction reaching the normal levels.[2]

Statistical analysis of data between the two groups performed with SPSS statistical software version 21. Data presented as Mean±SD deviation and percentage, chi-square test used for comparison

of non-parametric data, t-test used for continuous parametric data. P-value<0.05 considered a statistically significant.

Results

This study included 16 children with sciatic nerve play after intragluteal injection. The mean age was 4.35±1.98 with a range of 1.5 to 8 years. Five children (31.3%) were females and 11 (68.8%) were males (Table 1). Children were divided to 2 groups; group-I (N=10) underwent surgical exploration, with mean age (4.2±1.8), male: female ratio was 2.33:1, and group-II (N=6) treated conservatively with mean age (4.3±1.6), male: female ratio was 2:1. There was no significant difference between the two groups regarding age and sex as shown in table 2.

Clinically; pain, limping gait, vasomotor changes, sensory loss were the predominant manifestations in the both groups (100%). Right foot drop (M0, S0) was present in 6 children in group-I and 4 children in group-II. Left foot drop (M0, S0) was present in 3 children in group-I and one child in group-II. No significant difference between the two groups as shown in table 2.

Antibiotics, analgesics and anti-emetics were the commonest causative agents in the all studied patient. (Table 1)

EMG was performed for all children at initial presentation and revealed sciatic nerve injury with complete degeneration of common peroneal nerve. Six child's families preferred to continue conservative treatment in the form of physiotherapy and neurotropic and represent group-II. Ten children underwent surgical exploration and represent group-I.

EMG at 6 months follow-up shown that: in group-I: 8 of 10 children partially improved, where in group-II: one of 6 children show partial improvement, with significant difference between the two group (P=0.021). EMG at 12 months follow-up shown that in group-I: complete improvement in 8 children, partial improvement in 1 child and no improvement in another child, where in group-II: 2 of 6 children show partial improvement with no improvement in the other 4 children with significant difference between the two groups (P=0.011). (Table 3)

It was difficult to find a relationship between nerve lesion tract and amount of drug injected, since often the quantity of drug was unknown and the scar nerve reaction variable. Epineurolysis was done for all children with no reported complications.

The functional status was evaluated according to nerve injury committee score[5] has been shown in table 4.

Table 1. Demography Data of the Studied Children.

Parameters	Patients N=16	
Age	4.35±1.982 (1.5-8) years	
Sex	Male Female	11 (68.75%) 5 (31.25%)
Clinical picture	Pain Rt foot drop, vasomotor changes, sensory loss Lt foot drop, vasomotor changes, sensory loss	16 (100%) 13 (81.25%) 3 (18.75%)
Causative agent	Antibiotics Analgesics Anti-emetics	8 (50%) 6 (37.5%) 2 (12.5%)
EMG at presentation	Complete peroneal nerve degeneration	16 (100%)

Table 2. Demographic data of Studied Groups

Parameters		Group-I (N=10)	Group-II (N=6)	T value	P value
Age: Mean±SD (min-max)		4.2±1.8 (2-8)	4.3±1.6 (1.5-8)	1.560	0.764
Sex	Male Female	7 (70%) 3 (30%)	4 (66.7%) 2 (33.3%)	2.145	0.843
Presentation	Pain Rt foot drop, vasomotor changes, sensory loss Lt foot drop, vasomotor changes, sensory loss	10 (100%) 6 (60%) 3 (30%)	6 (100%) 4 (66.6%) 1 (16.7%)	0.980	0.186
Causative agent	Antibiotics Analgesics Anti-emetics	6 (60%) 3 (30%) 1 (10%)	2 (33.3%) 3 (50%) 1 (16.7%)	1.896	0.320

Table 3. EMG Results at 6 and 12 Months Follow-up

EMG	Improvement	Group-I (N=10)	Group-II (N=6)	T value	P value
6 months	No Partial Complete	2 8 0	5 1 0	3.420	0.021*
12 months	No Partial Complete	1 1 8	4 2 0	4.170	0.011*

*Significant (P<0.05)

Table 4. Functional Outcome According to Nerve Injury Committee Score.[5]

Outcome Parameters	12 month Outcome	
	Group-I	Group-II
Good	8	-
Fair	1	2
Poor	1	4

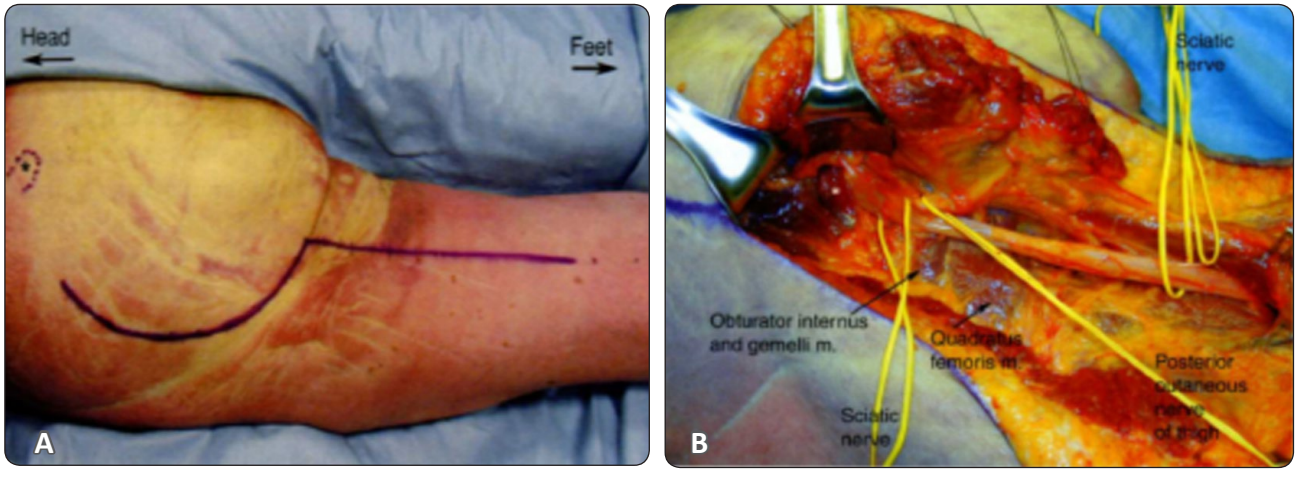

Figure 1 (A) show the line of skin incision, (B) show sciatic nerve at the sciatic foramen.[10]

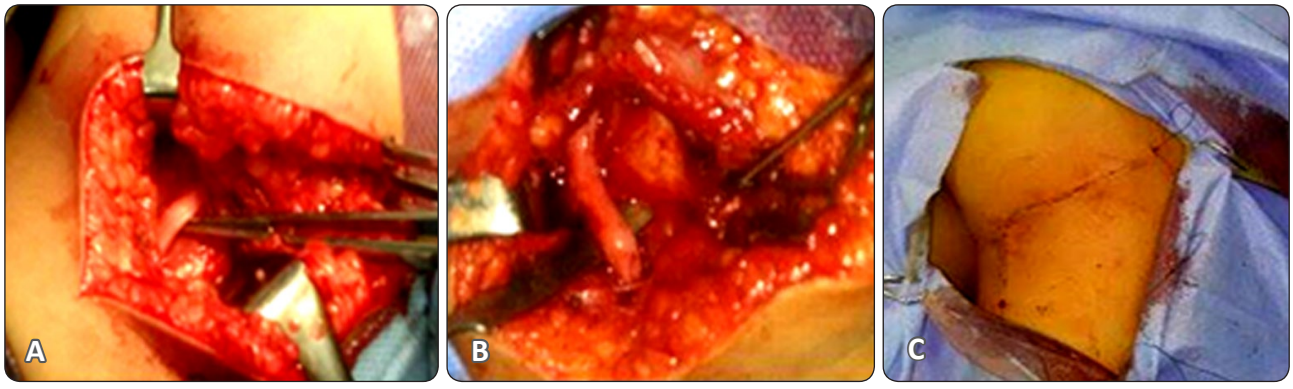

Figure 2. Operative images (A) show the sciatic nerve visible within the fat pad (B) show the sciatic nerve after neurolysis and application of local steroids to prevent re-adhesions (C) show the wound after closure.

Discussion

Post injection sciatic nerve injury is an iatrogenic problem that leads to significant health problems in children especially in developing countries.[1] The infragluteal approach was described by Henry 1957.[5] In Egypt the lesions of injected sciatic nerve occurred in abnormal sites due to the high rate of injection errors by un trained personnel, so this approach is suitable if sciatic nerve lesion within the gluteal region. Although it is the most common approach to sciatic nerve, it is risky as it needs detaching and reattaching the gluteus maximus so if re-approximation failed it will lead to gluteal dysfunction.[4,12] Which didn't occur in the present study because about 3 cm of gluteus maximus was divided with use of retractors for more proximal exposure of sciatic nerve.

After reviewing the present studied cases; post injection sciatic nerve injury is common in children which agreed with the Al-samman et al,[1] study reported children affected more than adults due to thin fat pad and lack of muscle bulk as well as gluteal intramuscular injection drugs are common among pediatric age group, with predominance of injury in male children in the present study as Mishra study[11] reported that most of his patients (80%) were children and male had higher risk than female due to thinner fat pad.

In the present study the main clinical manifestations were pain, limping gait, vasomotor changes, sensory loss and foot drop so common peroneal nerve was affected more than tibial nerve. The sciatic nerve is formed of large number of small bundles separated by abundant connective tissue so the needle can pass through these bundles without causing major injury. Some study[15] also reported that posterolateral localization and small amount of supporting connective tissue expose the common peroneal nerve to injection related injury. Right side was more affected than the left side in the present cases as in Ezeukwu study.[3] Different studies[15,3,16] mentioned that there are local anatomic variations predisposing the nerve to injury such as early division of sciatic nerve and absence of piriformis muscle indicating that the trauma will be proximal in the buttock which not occurred in the present study.

Antibiotics and analgesics were the most causative agents in between our patients and this related to the misuse of antibiotics in children, but we couldn't detect the amount of drug injected. The injury was induced by direct nerve injection and chemical effect of the drug.[15,3,16]

Electrophysiological study is important for treatment and prognosis of nerve injury, so EMG was done for all cases at initial presentation and revealed complete sciatic nerve injury with complete degeneration of common peroneal nerve, this similar to the results of Al-samman et al,[1] 6 cases preferred to complete physiotherapy. Ten cases underwent surgical exploration (epineurolysis) at 3m.

EMG at 12 months follow-up shown that in group-I: complete improvement in 8 children, partial improvement in 1 child and no improvement in another child, where in group-II: 2 of 6 children show partial improvement with no improvement in the other 4 children with significant difference between the two groups. Villarejo et al study[19] reviewed 370

cases of children with injection injury of the sciatic nerve or its peroneal and tibial components, their first group treated with rehabilitation and the second group underwent neurolysis by microsurgical techniques, they recommended EMG and follow-up for the first 3 months after the injury, patients should be operated on 3 months after injury if motor power and EMG findings not improved in spite of physical therapy. If the motor power and EMG findings improve during these 3 months, patients should continue with physical therapy. They achieved 100% excellent results with surgical treatment and 61% with the conservative treatment of their studied children.

Senes et al,[14] reported that; early exploration allowed better outcome due to reduced time necessary for development of peri-nervous fibrosis. Regarding the present study, 20% of cases improved conservatively so we recommend; giving chance for three months of conservative treatment before surgical exploration and use of endoscopic assisted surgery in the future to avoid gluteal dysfunction.

Conclusion

Surgical exploration of post injection sciatic nerve injury in children is feasible and effective management in reference to conservative methods. It may be of value not to delaying surgery beyond 3 months. A more sample size with long-term follow-up in recommended.

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الملخص العربي

دراسة مقارنة بين الاستكشاف الجراحى والعلاج التحفظى لاصابات عصب النسا مابعد الحقن فى الاطفال

البيانات الخلفية: يعتبر الحقن العضلى للارداف من أكثر الاسباب شيوعا لاصابة عصب النسا فى الاطفال وسقوط القدم من أكثر أعراض هذه الاصابة.

الغرض: توضيح دور الجراحة الاستكشافيه للعصب مقارنة بالعلاج التحفظى فى هؤلاء الاطفال.

تصميم الدراسة: دراسة مقارنة سريريه بأثر رجعى لمجموعتين من الحالات.

المرضي و الطرق: وقد أجريت هذه الدراسة على 16 طفل يعانون من اصابة بعصب النسا. حيث خضعوا لفحص اكلينيكى شامل واخذ التاريخ المرضى لهم مع عمل رسم العصبى الكهربائى. تم تقسيم الحالات الى مجموعتين: 1.المجموعة الاولى خضعت للجراحة الاستكشافيه. 2. المجموعة الثانية خضعت للعلاج التحفظى.

النتائج: وتبين ان الحقن العضلى بالمسكنات والمضادات الحيويه هى اكثر المواد المسببه لاصابة عصب النسا فى هؤلاء الاطفال. وتم متابعة الحالات بعد 3 و 6 و 12 شهر بالفحص الاكلينيكى والرسام العصبى الكهربائى.حيث تبين تحسن 8 حالات بالمجموعة الاولى بصورة كاملة وتحسن جزئى لحالة واحدة فى حين عدم التحسن لحالة واحدة. بينما تم تحسن 4 حالات فقط بالعلاج التحفظى بالمجموعة الثانية.

الاستنتاج: وبالتالى فقد تبين من تلك الدراسة فعالية الجراحة الاستكشافيه فى هؤلاء الاطفال مقارنة بالعلاج التحفظى.