



## Research Article

**IATROGENIC SCIATIC NERVE INJURIES FOLLOWING GLUTEAL INTRAMUSCULAR INJECTION AMONG CHILDREN**Al-samman Deena K<sup>1\*</sup>, Al-asaady Nashwan A<sup>2</sup><sup>1</sup>College of Pharmacy, Department of Pharmacology and Toxicology, University of Mosul, Iraq<sup>2</sup>Rheumatology and Medical Rehabilitation Unit, Al – Salaam Teaching Hospital, Iraq

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**DOI: 10.7897/2230-8407.050457****ABSTRACT**

The objective of this is to provide an overview of iatrogenic sciatic nerve injuries following gluteal IM injection, to determine predisposing factors and the outcome of a conservative treatment of patients with the aim of highlighting practical preventive measures to improve the health of the children by preventing disabilities through safe injection practice in Mosul city. A retrospective study of all children had iatrogenic sciatic nerve injuries following gluteal intramuscular injection were evaluated and treated at Rheumatology and Medical Rehabilitation Unit in Al – Salaam Teaching Hospital and from private clinic of Rheumatology and Medical Rehabilitation in Mosul city, between March 2013 and January 2014. A total of 33 children were enrolled in this study. Of these, 17 patients (51.5 %) were males and 16 patients (48.5 %) were females, with ages ranging from 1 month to 7 years (mean age was 1.9 years). Nineteen cases (57.6 %) aged between 1 and 6 months. Most patients were poor and from low social class, 90.9 % of the cases were sustained their nerve injury by nurses, and Antibiotics that mixed with other drugs simultaneously were the offending agents in 81.8 % of patients. Foot drop is the commonest presenting clinical feature (63.6 %). Complete recovery was reported in 16.7 % of the patients, partial recovery in 73.3 % and 10 % had no clinically measurable improvement from the baseline. Injection-induced sciatic nerve injury is common among pediatric patients in our city. Electrophysiological examinations provide significant clues about the prognosis and treatment. The role of early rehabilitation is important for smooth recovery with prevention of complications which lead to deformity and disability. It is also emphasized that in order to reduce the frequency of this handicapping condition, intra gluteal injections to the infants should be prohibited and should be prescribed only when mandatory, not mix more than one drug in same syringe and should be administered by well-qualified and competent personnel.

**Keywords:** Intramuscular injection, sciatic nerve injury.**INTRODUCTION**

Sciatic nerve injury is a well-known complication of intramuscular (IM) gluteus muscle injections. It is the second most common cause of sciatic nerve injury, especially in children, after hip arthroplasty<sup>1</sup>. Unsafe injections result in multiple complications particularly infections such as Hepatitis B, Hepatitis C and HIV<sup>2-4</sup>. In addition injections may lead to injury to the nerve causing acute flaccid paralysis of the limb<sup>5</sup>. The injection healing ritual brings comfort even if it appears irrational. Thus, they have become the modern magic therapy, people demand them, accordingly, doctors and health workers prescribe them too often. Therefore, IM gluteus muscle injections are presently a common practice in developing countries, especially among the pediatric age groups<sup>6</sup>. Damage to the sciatic nerve by injection has been reported from several parts of the world; even developed countries like the USA are facing this problem. Injection injury account for 50 % of nerve injuries in one large series reported from the USA<sup>7</sup>. In addition, the World Health Organization (WHO) has been estimated that out of the 12 billion injections administered worldwide annually, 50 % are unsafe and 75 % are unnecessary<sup>8</sup>. The mechanism of injury is unknown, but allergic reactions, caustic effect of the drug injected, direct needle trauma, neuronal ischemia and secondary constriction by scar and direct nerve fiber damage are postulated<sup>9-10</sup>. A review of literature on relevant injection procedure found that injury to sciatic nerve is associated with the use of dorsogluteal site for injection because the sciatic nerve commonly courses this site<sup>11</sup>. The degree of nerve fiber injury depends on the site of injection and upon the specific agent injected<sup>12</sup>. It is manifests as paresis in the sciatic distribution followed by burning pain in the extremities,

several hours or days later, in addition to foot drop. Neurological sequels can range from minor transient sensory disturbance to severe sensory disturbance and paralysis, with poor recovery<sup>13</sup>. Injection practices have been the topic of many recent studies from the developing world. People in the South-East Asia region receive more than five injections per capita per year. Data collected in cross-sectional studies in India and Pakistan have found a high frequency of indiscriminate use of injections in these regions<sup>14</sup>. Studies from across the world have focused on nerve damage caused by wrong techniques of administering injections, especially in pediatric population<sup>15-16</sup>. More than 50 % of these injections are administered in unregistered health care facilities, non formal health care systems and at home by friends, relatives, barbers and housekeepers for indications that may include fever, pain, infections and injuries<sup>17</sup>. Common medications include antibiotics, antipyretics, and vitamins<sup>18</sup>. In many countries, including Iraq, many children suffer at the hands of untrained people who set themselves as experts of injections. The poorly educated and low social class people have no access to quality health workers afraid of modern doctors and their expensive prescriptions, they rely on someone friendly and cheap who appears more knowledgeable than they are. These formal and informal health care workers routinely prescribe injections to patients<sup>19</sup>. Thus this dilemma stresses the need to alert the public to seek medical help instead of continuing this practice. Hence it was decided to provide an overview of iatrogenic sciatic nerve injuries following gluteal IM injection, to determine predisposing factors and the outcome of a conservative treatment of patients with the aim of highlighting practical preventive measures to improve the

health of the children by preventing disabilities through safe injection practice in Mosul city.

### Patients and Method

This retrospective study was conducted between March 2013 and January 2014 at Rheumatology and medical rehabilitation unit in Al- Salaam Teaching Hospital and from private clinic of Rheumatology and medical rehabilitation, in Mosul city. We were able to identify a total of 33 cases of post-injection sciatic nerve injury, foot drop; that satisfied our inclusion criteria, i.e. symptoms and/or signs in the lower limb following an intra gluteal injection and they did not have any weakness in the limbs or associated sensory disturbances before the injection. In addition, they had received polio immunization to exclude poliomyelitis. A questionnaire was designated to include the following information: age, sex, socio-educational level and employment of parents, clinical presentation, duration, side affected, indication for injection, type of injected drug, interval between injection and presentation, personnel/place where injection was administered, immunization status, nerve conduction study, conservative treatment, type of physiotherapy and outcome at discharge. According to the routine of hospital, after a brief history and clinical examination, the motor nerve conduction study is done on lower limb nerves, the common peroneal and the posterior tibial. The relative involvement of the common peroneal and posterior tibial nerve was determined by comparing the power grade in the dorsiflexion and planter flexion of the foot at the time of the first presentation. The electromyographic study (EMG) was conducted on the extensor digitorum brevis, tibialis anterior, medial head of gastrocnemius and short head of biceps femoris. The motor symptoms and signs were graded using the Medical Research Council (MRC) grading score (0-5) for knee flexion, foot dorsiflexion, and plantar flexion muscles. The grading method was a modification of that used by Eric<sup>20</sup>. The electromyographic study was not possible in 9 cases because they were come too early after the event. The patients were followed up for 3 months period during the study with clinical evaluation to assess the degree of improvement by using MRC grading and they were divided in 3 groups:

- Complete recovery when MRC clinical grade of power is 5 on the last follow up visit.
- Partial recovery when the power recovered by > 1 grade from the baseline on the last follows up visit.
- No recovery when there was no measurable improvement from the baseline in the last follow up visit

All the patients had received splints, physiotherapy, analgesics, and vitamins during the follow-up.

### RESULTS

In this study there were 33 patients met the criteria for inclusion; of these, 17 patients (51.5 %) were males and 16 patients (48.5 %) were females, with ages ranging from 1 month to 7 years (mean age was 1.9 years). Nineteen cases (57.6 %) aged between 1 and 6 months. The parents were grouped as professionals and non-professionals. Eleven fathers were employers, and all the others were artisans such as butcher, farmer and workers. While most of the mothers were housewives. Most patients were poor and from low social class. In fact the exact site of the gluteal injection couldn't be identified in 26 cases. It was recorded as the right upper and outer quadrant in six cases and in the left upper

quadrant in one case. Twenty three patients (69.7 %) were affected on the right side while 10 patients (30.3 %) had the injury on the left side. The right side was equally affected in both male and female (Table 1). Antibiotic injections (Cefotaxime, Ceftriaxone and Ampicillin + Cloxacillin) were the offending agent in 27 patients (81.8 %), while 24 patients (72.7 %) had Dexamethasone injection that in many cases mixed with antibiotic injections and other injections including Diclofenac sodium (33 %), Novalgin (6 %), Iron dextran (3 %) and B- complex injection (6 %). In addition, 24 patients (72.7 %) had Lidocaine HCl mixed with other injection as anesthetic agent (Table 1). Results also showed that the majority of the injection (90.9 %) were prescribed and injected by nurses at private clinic and health centers, while 9.1 % injected by patients' relatives at home. The onset of the symptoms of sciatic nerve damage appeared immediately in 10, in less than six hours in 18 and after 48 hours in 5 cases. The chief complaint at presentation was varied: partial foot drop (63.6 %), followed by pain at either the gluteal region or lower limb (54.5 %), weakness of the lower limbs and inability to walk properly (18 %), complete foot drop (15 %) and 9 % of cases had sensory parasthesia and numbness. By far the most common underlying indication for which IM injection was given was upper respiratory tract infections (tonsillitis and bronchitis) in 20 patients (60.6 %), followed by enteritis in 8 cases (24 %) while the others were for fever, malaise and impetigo (Table 2).

**Table 1: Demographic features of enrolled patients (n = 33)**

Characteristic	Number (n = 33)	Percentage (%)
<b>Sex distribution</b>		
Male	17	51.5
Female	16	48.5
<b>Social class</b>		
Low	29	87.9
Medium	4	12.1
High	0	0
<b>Parents occupation</b>		
Professional	11	33
Non Professional	22	67
<b>Limb affected</b>		
Right male	12	36.3
Right female	11	33.3
left male	5	15.2
Left female	5	15.2
<b>Type of injection</b>		
Antibiotics	27	81.8
Lidocaine	24	72.7
Anti-inflammatory	24	72.7
Analgesics	13	39.4
Tonics	3	9
<b>Indications for injections</b>		
Upper respiratory tract infections	20	60.6
Enteritis	8	24.2
Others	5	15.2

Twenty four patients had undergone an initial EMG study, while not possible in 9 cases due to either there were only sensory abnormalities or because there was a lack of conduction abnormalities in the routine study done too early after the event. The analysis of the EMG features in the initial study after the injection trauma revealed 7 cases with sever sciatic nerve injury, 4 cases with partial sciatic nerve injury, 8 cases had sever involvement of the common peroneal nerve, 5 patients had partial involvement of the peroneal nerve.

**Table 2: Symptoms and the grading scores at presentation, onset and interval between injury and presentation**

Parameters	Numbers (n = 33)	Percentage (%)
<b>First symptoms at presentation</b>		
Partial foot drop	21	63.6
Pain	18	54.5
Inability to walk properly	6	18
Complete foot drop	5	15
Parasthesia and numbness	3	9
<b>Grading score</b>		
0	6	18.2
I	11	33.4
II	14	42.4
III	2	6
IV	0	0
V	0	0
<b>Onset</b>		
Minutes	10	30.3
Hours	18	54.5
Days	5	15.2
<b>Interval between injury and presentation</b>		
Hours	5	15.2
< 1 week	3	9.1
> 1 week-1 month	12	36.3
> 1 month	13	39.4

The number of physiotherapy sessions ranged from 7 to 15. The most frequently used mode of treatment was electric nerve stimulation for all patients, ultrasound therapy (72.7 %), muscle strengthening exercises and walking re-education (51.5 %) infra-red radiation (48.5 %) and splinting (39.4 %). Others, massage, hot packs and tactile stimulation (Table 3). Three patients not returned for follow up examination, therefore, we evaluated 30 patients during 3 months period. Five patients showed complete recovery (grade V), while 22 patients showed partial recovery on follow up examination (grade II, III and IV), whereas 3 patients had no clinically measurable improvement from the baseline (grade 0 and I) (Table 3). They were then sent to the neurosurgery department for consultation.

**Table 3: EMG analysis, types of physiotherapy and grading scores after treatment**

Parameters	Numbers (n = 33)	Percentage (%)
<b>EMG analysis</b>		
Sciatic nerve injury (sever)	7	21.2
Sciatic nerve injury (partial)	4	12.1
Common peroneal nerve (sever)	8	24.3
Common peroneal nerve (partial)	5	15.2
Cases not examined	9	27.2
<b>Physiotherapy type</b>		
Ultrasound therapy	24	72.7
Exercises	17	51.5
Infra-red radiation	16	48.5
Splinting	13	39.4
<b>Grading score*</b>		
0	1	3.3
I	2	6.7
II	2	6.7
III	7	23.3
IV	13	43.3
V	5	16.7

\*Three cases were not return to follow up examination

## DISCUSSION

Sciatic nerve injury due to IM gluteal injection is an iatrogenic problem that can cause significant health problems, especially in developing countries. It may lead to different clinical entities from mild paresthesia to serious

neurologic sequelae<sup>12</sup>. Although, post injection sciatic nerve injury can occur in adults and children, this study was only including children. They are more often affected than adults because of a thin fat pad and lack of muscle bulk as well as gluteal IM administration of drugs is presently a common practice among the pediatric age groups even when oral and other alternative routes are equally good and safe<sup>7</sup>. The results of this study showed that the 1 - 6 months age group had the highest incidence (57.6 %) of sciatic nerve injury following injection. This implies that this group is highly vulnerable, because there is not much gluteal muscle mass in infant. This result is in agreement with previous study done by Idowu *et al.* who reported that 0 - 2 years age group had the highest incidence of the cases<sup>13</sup>. All the cases reviewed were unilateral in presentation with more cases seen of the right side lower limb (69.7 %) than the left (30.3 %). This is in accordance with study of Ezeukwu<sup>21</sup>, while Alsheikh<sup>22</sup> found that the left lower limb was more affected in 63.88 % of the cases. In our study, the right side was equally affected in both sexes. In addition, the exact site of injection can't be identified in all patients; this is consistent with other previous study<sup>23</sup>. In this study, the majority of the injections were prescribed and administered by nurses (90.9 %), a fact that has been previously highlighted by other studies<sup>13,22</sup>. However, it may not be impossible that the so-called 'nurses' are auxiliary nurses or other health attendants. Furthermore, in this study most of the injuries were inflicted at private hospitals and clinics where, staffs with inadequate training can be labeled as nurses and are allowed to give IM injections. This situation points to the need to organize compulsory update and refresher courses for all health service staff who are involved in the administration of injections. The majority of parents in this study were non professionals from a low social class who probably had little or no formal education. Professionals in general have a better education and are less likely to patronize sub standard health facilities or quacks. For this reason, most cases were treated by sub-staff and nurses. Upper respiratory tract infections are common during cold winter season in our city, while in a study done at Nigeria, malaria was the main indication which is endemic there<sup>13</sup>. Therefore; Antibiotics were the main indication for IM injection. Sevim *et al.* reported that Metamizole and Cefazolin were responsible for injury<sup>24</sup>. In this study, Cefotaxime, Ceftriaxone and Ampiclox are reported to be the main culprits in infants and children (81.8 %). In addition, Dexamethasone injections were the other common offending agents in this study (72.7 %), which misused for the treatment of infection that in many cases mixed with antibiotics and other injections as analgesics. Furthermore, 72.7 % of cases had Lidocaine HCl that mixed with administrated injection as anesthetic agent. Some health workers are known to have strong preferences for injections even when oral and other alternative routes are equally good and safer. They indulge in these practices to convince the unrealistic eagerness of the parents of ill children to get a "quick cure". They believe that the injection would work better and faster than drugs given orally. This belief is erroneous and can be adduced to ignorance by the parents. This study observed that, some health workers would misuse the injectable drugs by mixing more than one type of drug in same syringe and injected simultaneously. All the cases had received a combination of 2, 3 or 4 drugs at the same site and time. Those mixed injections contained antibiotics, and/or analgesics and/or Dexamethasone, in addition to Lidocaine as anesthetics. So that, the large volume of the IM injection

might lead to sciatic nerve compression and injury. This is reflected by the large proportion of patients visited the Rheumatology and medical rehabilitation unit suffering from post IM injection foot drop. Furthermore, difficulty of restraining a fretful child and poor techniques such as angulating the needle while injecting can lead to direct trauma to the sciatic nerve that may cause damage. The onset of the symptoms was immediate in 30.3 % while in another study done by Maqbool *et al* the onset was immediate in 90.9 % of the patients<sup>25</sup>. The chief complaints at presentation are partial foot drop in 63.6 %, followed by pain at either the gluteal region or lower limb in 54.5 %, weakness of the lower limbs and inability to walk properly in 18 %, complete foot drop in 15 % and sensory parasthesia and numbness in 9 %, where as in a previous study done by Alsheikh<sup>22</sup>, foot drop was in 52.33 % followed by leg and foot weakness in 30.55 %, pain and numbness in 8.3 %. The electrophysiological examinations provide significant clues about the treatment and prognosis<sup>26</sup>. The extent of the recovery time and the prognosis depends on the injury grade. On the other hand, early rehabilitation and treatment with physiotherapy, analgesics, splints and vitamins, might be important to smooth recovery and to reduce the sequels and complications. In our study, the follow-up examination detected patients who would benefit from these treatments especially in patients with mild lesions (16.7 %) who had a good prognosis with complete recovery (grade 5). Whereas 73.3 % showed partial recovery on follow up examination (grade II, III and IV). Three patients had no clinically measurable improvement from the baseline (grade 0 and I). Injection neuritis is not only an issue of patient safety or quality of care; it is an issue of medical ethics, as well. To prevent this avoidable and abandoned nerve injury, the practice of IM injection especially in the high-risk cases like children, should be prescribed only when mandatory and administration by well-qualified and competent personnel<sup>27</sup>. There is a need to give appropriate education to health service providers, parents and child care givers on the dangers of parenteral administration of drugs, with a view to discourage the existing dangerous preference of health workers and parents for injection. In conclusion, injection-induced sciatic nerve injury is common among pediatric patients in our city. Electrophysiological examinations provide significant clues about the prognosis and treatment. The role of early rehabilitation is important for smooth recovery with prevention of complications which lead to deformity and disability. We also emphasized that in order to reduce the frequency of this handicapping condition, intra gluteal injections to the infants should be prohibited and should be prescribed only when mandatory, not mix more than one drug in same syringe and should be administered by well-qualified and competent personnel.

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