Research Article

Ultrasound-guided versus fluoroscopy-guided caudal epidural steroid injection in treatment of refractory back pain with radiculopathy: An ultrasound study

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Abstract
Objective: The aim of this study is to assess the efficacy of ultrasound (US)-guided Caudal Epidural Steroid Injection (CESI) compared with fluoroscopy (FL)-guided CESI in patients with refractory back pain associated with radiculopathy. **Methods** This study was carried out on 50 persons selected from those attending the outpatient clinics of internal medicine department of Al-azhar university hospital, Assuit. From April 2018 to July 2018. The persons were divided into two groups: Group (A): included 25 patients who received US-guided CESI. They were 13 females and 12 males. Their age ranged from 30 to 60 years. Group (B): included 25 patients who received FL-guided CESI. They were 16 females and 9 males. Their age ranged from 27 to 57 years. **Results**: About 40% of patients were females & 60% of the patients were males. About 42.5% of patients had disease duration of 3-5 years, 37.5% of patients had disease duration of 5-10 years, 10% of patients had disease duration of 10-20 years, 5% of patients had disease duration of >20 years. About 15% of patients had BMI (18.5-24.9), 57.5% of patients had BMI (25-29.9), 27.5% of patients had BMI (>30). In this study There: There is a statistically significant difference between age and Ultrasound findings p. value <0.05. There is no significant difference between gender and Ultrasound findings. There is a statistically significant difference between disease duration and Ultrasound findings p. value<0.05. **Conclusion**: Caudal epidural injections are considered as the safest and easiest procedures of epidurals with minimal risk of coincidental dural puncture.US is excellent in guiding caudal epidural injection with similar treatment outcome as compared with FL-guided caudal epidural injection and ultrasound should be the preferred alternative when FL is not available. Caudal epidural steroid injection offer alternative effective approach in management of LDP of duration < 5 years, target level not L2-3/L3-4, -ve FST, LDP other than foraminal type and age <40 years and sufficient diameter of SH. Ultrasound is easy to perform with less complications and superior to FL in saving the procedure time owing to easy detection of the SH.
Keywords: lumber disc prolapse, Musculoskeletal ultrasonography, caudal epidural steroid injection, fluoroscopy, visual analogue scale, straight leg raising test, sacral hiatus, femoral stretch test and body mass index.

Introduction
Low back pain (LBP) is one of the most common medical problems. In general LBP is not a specific disease but rather a symptom that may be caused by a large number of underlying problems of varying levels of seriousness. These include structural problems of the back, inflammation, muscle and soft tissue injury, secondary response to degenerative disc disease and disc herniation[(1)].

Epidural steroid injection (ESI) has been used to treat LBP caused by lumbar disc herniation for many decades. There is no definitive research to dictate how many ESIs should be administered or how frequently they should be given. In general, the consensus is to perform up to three epidural injections per year[(2)]. Steroids inhibit the inflammatory response caused by chemical and mechanical sources of pain. Steroids also work by reducing the activity of the immune system to react to inflammation associated with nerve or tissue damage[(3)].

Caudal epidural steroid injection (CESI) can be helpful in the symptomatic treatment of lumbar radicular pain due to spinal canal stenosis or

herniated disc[4]. Successful caudal injection relies on the accurate placement of a needle into the epidural space through the sacral hiatus[5]**.** Incorrect needle placement occurs at a frequency of 25% to 36% of cases when performed without fluoroscopy (FL) guidance. Studies on FL suggested that CESI should proceed under FL guidance and contrast media [6].However, the application of FL requires careful consideration due to the possibility of ionizing radiation exposure. Because the injection is administered close to the gonadal area, treatment of patients of reproductive age should be considered with caution. And the high cost of FL must be considered[7]**.**Imaging-guided techniques with fluoroscopy or computed tomography increase the precision of the injection procedures and help confirm needle placement[8]***.***

Patients and Methods

This study was carried out on 50 persons from those attending the outpatient clinics of internal medicine & Rheumatology, Physical medicine & Rehabilitation department of Al-azhar university hospital, Assuit. From April 2018 till July 2018.

Study design and population

The persons were divided into two groups:

- Group 1: included 25 patients who received US-guided CESI. They were 13 females and 12 males. Their age ranged from 30 to 60 years
- Group 2: included 25 patients who received FL-guided CESI. They were 16 females and 9 males. Their age ranged from 27 to 57years .

The inclusion criteria were as follows:

- Included patients who had experienced chronic radicular pain for at least 3 months diagnosed by routine clinical examination and MRI.
- Aged 25 or older.
- Failed to respond to anti-inflammatory medications, analgesics or physical therapy of at least 6 weeks and refuse surgery or were unfit for surgery.

Exclusion Criteria:

- Patients with inflammatory low back pain.
- Psychiatric disorders,
- Bleeding disorders,
- Infection sign,
- Autoimmune connective tissue disorders.
- Patients with progressive motor deficit or significant sensory deficit, cauda equine syndrome. We permitted only acetami-nophen and nonsteroid anti-inflammatory drugs (NSAIDs) for the pain control.
- Osteoporosis.
- structural scoliosis, vertebral fracture.
- pregnancy, malignancy, spinal metal implants.
- Increased intracranial tension, diabetes mellitus, hypovolaemia and uncontrolled medical.
- Problems such as congestive heart failure.
- Obesity with body mass index 45.

Results

This study was carried out on 50 persons: group (1) 25 patients treated by ultrasound guided CESI (13 females and 12 males); with age ranged from 30 to 60 years, (mean age 46.76±9.15 years), the disease duration ranges from 0.5 to 10 years (4.14±3.04). Group (2)**:** 25 patients who received FL-guided CESI (16 females and 9 males). Their age ranged from 27 to 57 years (mean age 4.02±2.88years), the disease duration ranges from 0.5 to 9years (4.02±2.88).

Table 1: Demographic data of the two studied groups:

Variable	Group I (n=25)	Group II (n=25)	t	P
Age (years)				
Mean±SD	46.76±9.15	43.12±9.41	1.387	0.172 NS
Median	48	45		
Range	30-60	27-57		
BMI (Kg/m$^{2)}$				
Mean±SD	28.4±7.52	30.22±7.97	0.831	0.410 NS
Median	28	29		
Range	18-40.5	18.5-46.5		
Variable	**Group I**	**Group II**	**X^2**	**P**
	No.(%)	**No.(%)**		
Age group				
>= 40 years	19(76.0%)	17(68.0%)	0.397	0.529 NS
<40 years	6(24.0%)	8(32.0%)		
BMI				
Normal (18-25)	10(40.0%)	8(32.0%)	0.422	0.810 NS
Over weight (> 25-30)	6(24.0%)	6(24.0%)		
Obese (>30)	9(36.0%)	11(44.0%)		
Sex				
Male	12(48.0%)	8(32.0%)	1.333	0.248 NS
Female	13(52.0%)	17(68.0%)		

This table show: differences between the two studied groups as regard age, BMI, sex distribution and duration of disease which give anon significant statistics.

Discussion

In our study the obtained results showed non-statistical significant differences between the two studied groups as regard age, BMI, sex distribution and duration of disease. These results in agreement with the study done by Park[9]; Park[10]; Hazra[11] and Akkaya[12] who reported that variances among age, BMI, sex distribution and duration of disease were non-significant between the US and FL groups.

In our study obesity was not necessarily associated with difficult in CESI. Patients with mean of BMI 30 kg/m2 were included in our study in both groups in disagreement with the study done by Park[10] mentioned that one of his study limitations is that US-guided CESI was done in patients with BMI <30 kg/m^2, although Blanclais[8] reported easy identification of the SH in obese patients by US. Such finding coincides with that published by Njkooseresht[13] who stated that 67.6% of their patients were over-weight or pre-obese, and did not observe excessive fat tissue overlying the sacrum to make the anatomic details of the SIJ invisible.

Regarding the time of procedure, there was statistical significant increase in time among Group II (FL).Similar results were obtained by Akkaya[12] who also reported statistical significant increase in time of procedure among FL group. This could be attributed to that caudal anatomy can be visualized in more detail with US. Using US, the average time span from locating the sacral hiatus to the insertion of the needle into the caudal epidural space was less than 2 minute. Under US guidance, chiefly only one attempt is needed in guiding the needle into the caudal epidural space.

However, FL is used for many shots and injecting of contrast media and imaging span more time (Hanlon and Peng)[14]; Akkaya[12] The SH could only be measured in the US group and couldn't be measured in the FL group. The mean ± SD diameter of the SH was (4.69±1.69) with range from 1.3 -8.9 mm in the US group. In our study Comparing variances in the target root levels, disease duration and type of LDP revealed non-significant values among the two studied groups. Similar results were obtained by

Park[9], Park[10] and Akkaya[12] who found variances in target root level and LDP types were non-significant between the two studied groups.

In our study regarding SLRT and FST as clinical assessment tests, and ODI, non-significant statistical differences were observed between the US and FL groups before injections. But there is significant statistical differences were observed between the US and FL groups before injections as regarded VAS. These findings are in a close agreement with that presented by Nandi and Chowdhery[15] who also used Straight leg raising test as indicator for clinical assessment before and after CESI arid reported a no significant difference before injection in their two studied groups. Moreover, the obtained results are in harmony with that detected by Park[9] , Park[10] and Akkaya[12] who reported non-significant differences between the US and FL groups as regard VAS and ODI before injections. In our work, there was highly statistical significant improvement in SLRT, VAS and ODI at I week, 1 month and 2 months after injection versus before injection in the two groups. This indicate improvement in pain alleviation and function after injections for 2 months in the two groups, while there was no statistical significant differences in these parameters in between I week versus 1 months or 1 month versus 2 month versus after injections; that indicates persistence of improvement. The results in the present study are consistent with the previous observations of Park[9]; Park[10]; Hazra[11] and Akkaya[12] who demonstrated significant improvement of pain and function in the US and FL guided CES as denoted by improvement in VAS and ODI after injections versus before injection Additionally, Nandi and Chowdhery[15] reported significant statistical difference in the SLRT, modified Schober test, VAS and ODI before versus I month after CESI and before versus 2 months after CESI in his randomized controlled clinical trial to detect the effectiveness of CESL The current results showed non-statistical significant difference between the US and FL groups as SLRT, VAS and ODI at I week,1 months and 2 months after injection. This is well in line with the results of Park[9]; Park[10]; Hazra[11] and Akkaya[12] who stated that there wasn't statistical significant improvement between the US and FL guided CESI in pain and function as denoted by improvement in VAS and ODI after injections. In our study, the SH was identified in all patients (100.0%) in the US group. In the present study, we recorded minimal complications in the form of dizziness and transient headache with only one recorded case of syncopal attack. There was not statistical significant difference regarding complications between the US and FL group. Similar results were obtained by Park[9] and Akkaya[12] who recorded minimal complications of facial flushing, vasovagal attack and transient headache and found non statistical significant difference between the US and FL groups as regards complication. Our study showed clinically meaningful and significant improvement in all parameters at the end of two months period. We demonstrated successful treatments in 84% and 68% of patients in the US and FL groups respectively at the end of 2 months period. Successful treatments did not show statistical significant difference between the two groups.

Conclusion

Caudal epidural injections are considered as the safest and easiest procedures of epidurals with minimal risk of coincidental dural puncture.US is excellent in guiding caudal epidural injection with similar treatment outcome as compared with FL-guided caudal epidural injection and ultrasound should be the preferred alternative when FL is not available. Caudal epidural steroid injection offer alternative effective approach in management of LDP of duration < 5 years, target level not L2-3/L3-4, -ve FST, LDP other than foraminal type and age <40 years and sufficient diameter of SH. Ultrasound is easy to perform with less complications and superior to FL in saving the procedure time owing to easy detection of the SH.

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