

Clinical Audit Study for Use of Corticosteroids in Treatment of Nervous System Infections

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Abstract

Background: Anti-inflammatory therapy is indicated for CNS infection. Corticosteroids are the most valuable anti-inflammatory drugs for CNS disease. They reduce CNS edema via their action on blood vessels, and they produce anti-inflammatory effects via their action on neutrophils and inhibition of cytokine synthesis.

Aim of the Study: To assess how much the adopted protocol of using corticosteroids in management of CNS infections is implemented in Assiut University Children Hospital (A.U.C.H).

Patients and Methods: Retrospective study was conducted on patients admitted to Emergency unit, intermediate care unit, pediatric intensive care unit and department of neurology at Assiut University Children Hospital during the period from January 2016 to December 2016. Data were collected and compared to guidelines.

Results: Corticosteroids was used in 100% of cases. Most of cases with CNS infection who received steroid treatment guided by treatment protocol showed marked improvement in GCS score, tendon reflexes, muscle tone and convulsions.

Conclusion: Corticosteroids are usually the primary drugs used to treat immune-mediated disorders of the CNS, including corticosteroid-responsive meningitis and corticosteroid-responsive meningomyelitis.

Key Words: Corticosteroids – CNS infections – Brain edema – Anti-inflammatory.

Introduction

IN general, the central nervous system (CNS) is well defended against infection. The spine and brain are sheathed in tough, protective membranes, dura matter, pia matter and arachnoid matter. These defenses are not absolute. In rare cases, bacteria gain access to areas within the CNS [1].

Infections of the CNS can be divided into 2 broad categories; those primarily involving the meninges (meningitis) and those primarily confined to the parenchyma (encephalitis) [2].

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Infectious organisms can invade the fluid surrounding the brain. The body tries to fight the infection by increasing the number of white blood cells (normally a helpful immune system response), but this can lead to increased inflammation. As the inflammation increases, brain tissue can start swelling and blood flow to vital areas of the brain can decrease. As pus and other material from an infection accumulate in CNS, pressure is exerted on the brain or spinal cord. This pressure can damage the nervous system tissue, possibly permanently. Without treatment; CNS infection is fatal [3].

Adjunctive treatment with steroids for bacterial meningitis was reported in the 1950s in the form of several case reports and a small case series, all of which indicated improved outcomes for patients treated with antibiotics in conjunction with adrenocorticotrophic hormone and hydrocortisone compared with patient outcomes in earlier reports of treatment with antibiotics alone [4]. Interestingly, these benefits were not observed if steroid treatment was delayed until 5 days after admission. Bacterial lysis induced by antibiotics causes inflammation in the subarachnoid space, and this response is attenuated by steroid treatment, thereby improving the outcome [5].

Patients and Methods

Patients and methods:

Research design: Clinical retrospective audit on use of corticosteroids in treatment of nervous system infections in children at A.U.C.H from January 2016 to December 2016.

Abbreviations:

CNS : Central nervous system.
ADEM : Acute disseminated encephalomyelitis.
A.U.C.H : Assiut University Children Hospital.
C.S.F : Cerebrospinal fluid.
G.C.S : Glasgow coma scale.

Inclusion criteria:

This clinical audit study included all children with:

- Bacterial meningitis.
- Tuberculous meningitis.
- Acute infectious encephalitis.
- Herpes simplex encephalitis.
- Acute disseminated encephalomyelitis.

Exclusion criteria:

Children were excluded from this study if they were diagnosed as having:

- Brain tumor.
- Neurodegenerative disorders.

- Congenital cranial malformation.
- Intracranial hemorrhage.

Results

Our study is a clinical retrospective audit on use of corticosteroids in treatment of nervous system infections in children at A.U.C.H from January 2016 to December 2016. The study included 50 patients with CNS infections. 27 cases were male and 23 cases were female. Nineteen cases were below the age of one year, 25 cases between the age of one year and ten years and 6 cases more than ten years old. Data of the study showed that AUCH partially followed the reference standard of the study.

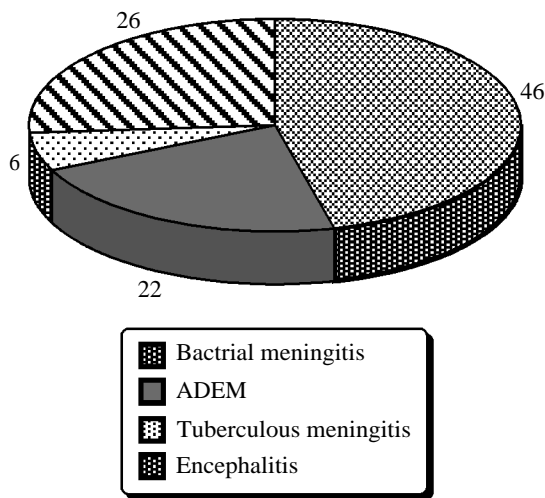


Fig. (1): CNS infection type distribution.

Table (1): Corticosteroids use in bacterial meningitis group.

	Bacterial Meningitis (n=23)			
	Yes		No	
	No.	%	No.	%
Dexamethasone use	23	100.0	0	0.0
Administered at 15-20min before or with the 1st dose of antibiotics	12	52.2	11	47.8
Dose: 0.15mg/kg dose q6h.	10	43.5	13	56.5
For 2-4 days	4	17.4	19	82.6
Side effects of corticosteroids	12	52.2	11	47.8
Improvement:				
GCS	22	95.7	1	4.3
Muscle tone	13	56.5	10	43.5
Muscle reflexes	17	73.9	6	26.1
Convulsions	14	60.9	9	39.1

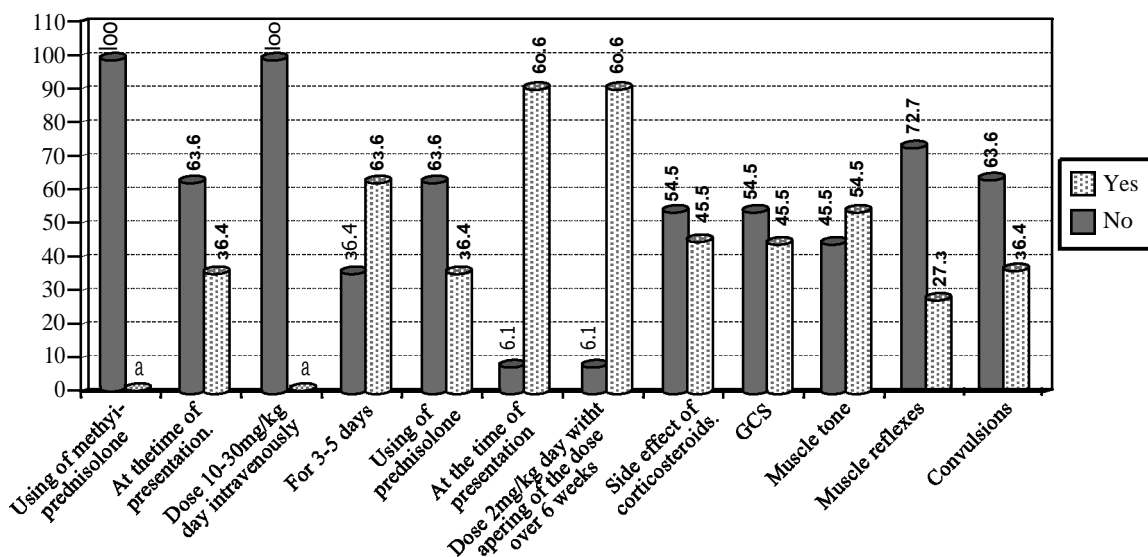


Fig. (2): Corticosteroids use in ADEM group.

Table (2): Corticosteroid use in Tuberculous meningitis.

	Tuberculous meningitis (n=3)			
	Yes		No	
	No.	%	No.	%
Dexamethasone use.	3	100.0	0	0.0
At the time of presentation.	1	33.3	2	66.7
Patients with GCS score of less than 15 or who have a focal neurological deficits administrated steroids as guided protocol.	1	33.3	2	66.7
Patients with normal mental status and no neurological deficits administrated steroids as guided protocol.	1	33.3	2	66.7
Patients with normal mental status and no neurological deficits didn't administrated steroids as guided protocol.	1	33.3	2	66.7
Side effect of corticosteroids.	3	100.0	0	0.0
<i>Improvement:</i>				
GCS	0	0.0	3	100.0
Muscle tone	1	33.3	2	66.7
Muscle reflexes	0	0.0	3	100.0
Convulsions	1	33.3	2	66.7

Table (3): Corticosteroids use in encephalitis.

	Encephalitis (n=13)			
	Yes		No	
	No.	%	No.	%
Dexamethasone use	13	100.0	0	0.0
After 3 days of presentation	2	15.4	11	84.6
Dose: 0.15mg/kg dose q6h	4	30.8	9	69.2
For 3-5 days	2	15.4	11	84.6
Prednisolone use	2	15.4	11	84.6
Dose: 2 mg/kg day once	2	15.4	11	84.6
For 3-5 days	1	7.7	12	92.3
Side effects of corticosteroids	4	30.8	9	69.2
<i>Improvement:</i>				
GCS	11	84.6	2	15.4
Muscle tone	8	61.5	5	38.5
Muscle reflexes	8	61.5	5	38.5
Convulsions	8	61.5	5	38.5

Discussion

Our study includes 50 patients diagnosed as CNS infections at Assiut University Children Hospital. Their age ranged from 1 month to 18 years, 27 cases were males and 23 cases were females.

A full history and detailed clinical (general, systemic and neurological) examination must be done for all cases of suspected CNS infection (full history was taken from 98% of cases, but full examination was done for 90% of cases).

Laboratory investigations (e.g. CBC, CRP, ESR, serum Na, K, ca, Mg, BUN, serum creatinine, blood culture and CSF tapping for analysis, culture and sensitivity test and serology for viral infection must be done for all cases of suspected CNS infection in children (In our study all those investigations were done in only 36% of cases, CSF analysis was done for all cases).

Corticosteroids must be administrated as adjunctive therapy for all cases of CNS infection in children (In our study all cases were treated with corticosteroids).

Corticosteroid therapy must be started at appropriate time as adjunctive therapy according to the type of CNS infection (In our study, only 76% of cases started corticosteroids at appropriate time).

Corticosteroids must be given in appropriate doses and route according to the adapted protocol of corticosteroid use in management of CNS infection in children (In our study 57% of cases administrated corticosteroids in appropriate doses, but 95% of cases administrated it in appropriate route).

Corticosteroids must be given for appropriate duration according to the type of CNS infection and following the treatment guidelines provided (In our study 88% of cases administrated corticosteroids for appropriate duration).

Each case treated with corticosteroids must be observed during and after treatment for any steroids side effects and should be treated (In our study 27% of cases suffered from corticosteroids side effects such as gastritis).

Meticulous and long term clinical follow-up of all cases of CNS infection treated with corticosteroids for development of any symptoms of complications and neuroimaging follow-up study may be indicated (In our study, regular long term follow-up was done for only 47% of cases).

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المراجعة الأكلينيكية لدور مادة الكورتيزون في علاج أمراض التهابات الجهاز العصبي

عدوى الجهاز العصبي المركزي هو السبب الأكثر شيوعاً للحمى المرتبطة بعلامات وأعراض مرض الجهاز العصبي المركزي لدى الأطفال. العديد من الكائنات الحية الدقيقة يمكن أن تسبب العدوى. العدوى الفيروسية في الجهاز العصبي المركزي هي أكثر شيوعاً من العدوى البكتيرية والتي بدورها هي أكثر شيوعاً من العدوى الفطرية والطفيلية.

الهدف من هذه الدراسة المراجعة الأكلينيكية بأثر رجعي هو تقييم مدى تطبيق بروتوكول استخدام الكورتيكوستيرويدات في علاج الجهاز العصبي المركزي في مستشفى الأطفال بجامعة أسيوط (A.U.C.H).

المرضى المستهدفين من هذه الدراسة بأثر رجعي كانوا الأطفال الذين تم تشخيص إصابتهم بعدوى الجهاز العصبي المركزي وتم قبولهم ودخولهم للمستشفى خلال الفترة من يناير ٢٠١٦ وحتى ديسمبر ٢٠١٦.

وشملت الدراسة ٥٠ طفلاً مريضاً بالتهابات الجهاز العصبي المركزي. وكان ٢٧ منهم من الذكور، ٢٣ من الإناث. ١٩ حالة كانت دون سن سنة واحدة، ٢٥ حالة ما بين سن سنة واحدة وعشر سنوات و٦ حالات أكثر من عشر سنوات. وأظهرت بيانات هذه الدراسة التذيقية أن مستشفى الأطفال بجامعة أسيوط تطبق البروتوكول المقترح لعلاج تلك الحالات بشكل جزئي على النحو التالي:

- ١- عدم إستيفاء بيانات التاريخ المرضي للحالات المدروسة.
- ٢- عدم إستيفاء عمل فحص بدني وعصبي وتسجيل البيانات بشكل كامل ومرتب في عدد محدود من الحالات.
- ٣- لم يتم عمل مزرعة من بذل النخاع الشوكي في ٧٨٪ من الحالات.
- ٤- لم يتم عمل معامل البروتين النشط في ٧٤٪ من الحالات.
- ٥- لم يتم فحص عوامل التجلط في ٧٦٪ من الحالات.
- ٦- لم يتم التصوير بالرنين المغناطيسي على المخ في ٥٦٪ من الحالات ولم يتم عمل رسم المخ في ٥٢٪ من الحالات.
- ٧- بروتوكول العلاج باستخدام الكورتيزونات في حالات عدوى الجهاز العصبي المركزي لا يطبق بصورة كاملة.