The Role Of Computed Tomography (CT) Scans In The Management Of Orbital Cellulitis

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ABSTRACT

Aim: to evaluate the role of CT scan in evaluating hospitalized patients for suspected orbital cellulitis.

Method: this retrospective study was conducted at prince Rashid Bin Al Hassan Military hospital and Princess Haya Military hospital. All patients who were admitted to the hospital for suspicion of orbital cellulitis and underwent orbital and sinuses CT scan with and without contrast were included in the study. The results of the scans were recorded and analyzed. The medical records of the enrolled patients were reviewed regarding age, gender, medical treatment received and type of surgical intervention. The CT reports were analyzed regarding its effect on the management plans and were compared with other studies performed worldwide.

Results: 16 patients with a mean age of 9.3±3.2 years were enrolled in the study. 81.3% of patients were ≤ 15 years of age. Sinusitis was present in (87.5%) of patients with orbital cellulitis, while dacryocystitisand trauma were responsible for the remaining cases. ethmoiditis was the most common etiology implicated in the development of cellulitis (71.4%). Fever and lid swelling were the most common presentations of orbital cellulitis. Post-septal orbital cellulitis was the most common CT findings among patients with sinusitis based on Chandler classification (69.2%).

Conclusion: CT showed was very effective in identifying the etiology of orbital cellulitis and determining its extent. It allows accurate staging of the orbital cellulitis which will be positively reflected on the disease outcome by helping the clinician in establishing appropriate therapeutic guidelines.

Key words: computed tomography scan, orbital cellulitis.

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Introduction

Orbital cellulitis refers to the orbital tissue infection (1). Accurate diagnosis and effective prompt treatmentare essential before the occurrence of some life-threatening compilations like brain abscess, meningitis and cavernous sinus thrombosis (2, 3).

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In addition, irreversible visual morbidity like optic nerve atrophy can be avoided by the early initiation of treatment (4).

Sinusitis remains the factor implicated in the development of orbital cellulitis. Trauma, dental abscess, peri-ocular surgeryand dacryocystitishave been also reported as the major causes of orbital cellulitis (5, 6). Thyroid eye disease, orbital pseudotumor, rhabdomyosarcoma, cavernous sinus thrombosis and Wegener granulomatosis should be excluded before the establishment of the diagnosis of orbital cellulitis (7, 8).

Medical treatments including antibioticsare the mainstay treatment option for orbital cellulitis (9). However, surgical intervention such as presence of a foreign body or in cases of subperiosteal or orbital abscess collection may be needed in few cases (10).

The aim of the present study is to evaluate the role of CT scanin patients who were admitted to the hospital for suspicion of orbital cellulitis.

Method

This retrospective study was conducted at Prince Rashid Bin Al Hassan Military Hospital. All patients who were admitted to the hospital for suspicion of orbital cellulitis were included in the study.The patients underwent orbital and sinuses CT scan with and without contrast. The scans were performed using the GE apparatus at 3 mm intervals. The medical records of the enrolled patients were reviewed for their age, gender, medical treatment received, type of surgical intervention if present, and the outcome of orbital and sinuses CT scans.

Results

The patients (16 patients) aged between 5-28 years (mean 9.3±3.2 years) were admitted for suspicion of orbital cellulitis between the years 2013 and 2019. (Table I) represents the demographic features of the patients.

(Table I) represents clinical signs of the patients at the time of admission.

Sinusitis was found in 13 patients (87.5%), while dacryocystitis (6.25%) and trauma (6.25%) were responsible for two cases which were in the form of preseptal orbital cellulitis. One patient was found to have an orbital pseudotumor (idiopathicorbital inflammatorysyndrome). In 10 patients (71.4%), ethmoiditis was the most common etiology implicated in the development of cellulitis followed by pansinusitis and frontalmaxillary sinusitis which was foundin 2 patients (15.4%) and one patient (7.7%) respectively.

(Table II) represents the outcome of CT findings among patients with sinusitis based on Chandler's classification.

Table I (Demographics of the patients includes)

Age	Number	Percentage	Males	M:F ratio

4-10 years	8	50.0%	5	1.7:1
>10-15 years	5	31.3%	3	1.5:1
>15 years	3	19.7%	1	2:1

Table I

Signs	Number of patients	Percentage (%)
Fever	12	67.7%
Lid swelling	6	37.5%
Limitation of EOM motility	2	12.5%
Exophthalmos	2	12.5%
Bilateral involvement	5	31.3%

Table II

Stage	Number of patients	Percentage (%)
Preseptal cellulitis	2	15.4%
Postseptal orbital cellulitis	9	69.2%
Subperiosteal abscess	1	7.7%
Orbital abscess	1	7.7%
Cavernous sinus thrombosis	0	0.0%

Discussion

Orbital infections are frequently seen in clinical practice and recently showed an increasing rate of hospital admissions (12, 13).Significant visual morbidity may occur in 10% of the cases (14).The mean age of the patients was 9.3 years which is higher than that found in most of the studies which mainly focused on the orbital cellulitis among children but it was comparable with other studies (15-17). Such variation is attributed

to the difference in method of the study. In the present study, most of the cases occurred in patients of 15 years of age or younger (81.3%) compared with patients older than 15 years of age (18.7%). Similarly, Murphy et al. studied 19 cases of orbital cellulitis of which 15 were among children (18).

Fever and lid swelling were the most common presentations of orbital cellulitis. Therefore, the presence of those signs should markedly increase the suspicion rate of orbital cellulitis. Limitation of extraocular muscles (EOM) motility which helps a lot in differentiation between preseptal from septal cellulitis was present among two patients. In the remaining patients, the CT scan was needed to identify the patients with septal cellulitis. Even in patients with decreased ocular muscle movement, CT was needed to explore the presence of abscess collection within the orbit (19). Bilateral cellulitis was seen in 31.3% of cases and all patients with pansinusitis developed bilateral disease. There was no significant difference between right and left eye involvement in unilateral cases.

Preseptal cellulitis was seen in 4 cases (25% of patients); two of them were due to sinusitis and two cases were attributed to non-sinusitis etiology. All cases of post septal orbital cellulitis were secondary to sinusitis. The most common sinus implicated in the development of orbital cellulitis was the ethmoid sinus, which is related to its anatomical proximity to the orbit. Based on the involvement of sinusitis with orbital cellulitis and according to the Chandler's classification; stage 1 orbital cellulitis was seen in only15.4% of caseswhile stage 2 was the most common form detected at a rate of 69.2% of cases. This is quite different from most of the results reported by other studies where preseptal cellulitis was the most common finding in patients with orbital cellulitis (20). The explanation is that the policy in our hospital is to treat patients with preseptal cellulitis as outpatients unless a high index of suspicion of postseptal cellulitis is made and only hospitalized patients were enrolled in the study. Thus, CT was very helpful in differentiating the patients with preseptal from postseptal cellulitis when the clinical presentation failed to do so.

Subperiosteal abscess and orbital abscess were detected among two patients. The clinical presentation couldn'tfind any clue for the presence of such complications except for the unsatisfactory response to intravenous antibiotic. When those complications were confirmed by CT, immediate surgical intervention was performed which allowed fast recovery of the patients without any morbidity.None of the patients had cavernous sinus thrombosis (stage 5). Nevertheless, some researchers believe that the cavernous sinus thrombosis is a complication of intracranial involvement of the infection rather than a complication of sinusitis (21). One patient was diagnosed to have scleral thickening, enhancement of Tenon, enlargement of extraocular muscles and exophthalmos and the diagnosis ofthe orbital pseudotumor was established and the proper management of the condition was presented to the patient. Many studies reported the efficacy of CT in evaluating the patients when found with clinical conditions like orbital pseudotumor and rhabdomyosarcoma which may present with a clinical picture similar to orbital cellulitis (22, 23, and 24).

Staphylococcus aureus,*Streptococci* and *Haemophilus influenza* species were the most common organisms responsible for the orbital cellulitis.However, the microbiological studies are usually insufficient and have poor yield in identifying the causative organisms and the extent of the disease unless samples are obtained during surgical intervention for abscess drainage and functional endoscopic sinus surgery (FESS) operation (14,25). CT is superior to laboratory studies in assessing the extent of the disease andthe lesser time consumed in the management of those patients where no time to waste and prompt treatment is needed before critical complications take place (26, 27). For such reasons, microbiological studies were not used in the management of the patients with orbital cellulitis in the present study.

Although the sample size was relatively small, the present study elucidated the marked efficacy of orbital CT in the management of patients with orbital cellulitis. It was found to be significant in identifying the etiology, extent of the disease and possible associated complication like a subperiosteal and orbital abscess. In addition, it was capable of identifying other clinical conditions resembling orbital cellulitis but with different treatment plans. Finally, recognizing the types and extent of cellulitis based on CT findings will greatly help in establishing the guidelines for management of such cases.

Conclusion

Orbital cellulitis occurred at a higher rate among younger patients and was mostly attributed to sinusitis. CT was significant in identifying the etiology of orbital cellulitis and determining its extent. It allows accurate staging of the orbital cellulitis which will be positively reflected on the disease outcome by helping the clinician in establishing appropriate therapeutic guidelines.Serious complications, such as cavernous sinus thrombosis,were not recognized among our study sample.

References

1. **Hegde R., Sundar G.Orbital cellulitis- A review**. Journal of ophthalmic science and research 2017; 55(3):211-219.
2. **Chaudhry IA, Al-Rashed W, Arat YO.** The hot orbit: Orbital cellulitis. Middle East Afr J Ophthalmol2012; 19:34-42.
3. **Hornblass A, Herschorn BJ, Stern K, Grimes C. Orbital abscess.** SurvOphthalmol1984; 29:169-78.
4. **Gherallag D., Quigley C., Lyons C., et al**. Optic Neuropathy and Sinus Disease. Journal of Medical Cases, 2018; 9(1): 11-15.
5. **Alsalamah AK, Alkatan HM, Al-Faky YH**. Acute dacryocystitis complicated by orbital cellulitis and loss of vision: A case report and review of the literature. Int J Surg Case Rep. 2018; 50:130-134.
6.**Arora N, Juneja R, Meher R.** Complication of an Odontogenic Infection to an Orbital Abscess: The Role of a Medical Fraudster ("Quack"). Iran J Otorhinolaryngology. 2018; 30(98):181-184.
7. **Robert T, John** Differential Diagnosis of the Swollen Red Eyelid.Am Fam Physician 2015; 15;92(2):106-112.
8. **Pakdaman MN, Sepahdari AR, Elkhamary SM.** Orbital inflammatory disease: Pictorial review and differential diagnosis. World J Radiol. 2014;6(4):106-15.
9. **Sullivan T, de Barra E.** Diagnosis and management of cellulitis. Clin Med (Lond). 2018; 18(2):160-163.
10. **José DC. , Edwin VG, Mónica Cecilia MU.** Orbital cellulitis complicated by subperiosteal abscess due to Streptococcus pyogenes infection.BoletínMédico Del Hospital Infantil de México 2017; 74 (2): 134-140.
11**. Chandler JR, Langenbrunner DJ, Stevens ER.** The pathogenesis of of orbital complications in acute sinusitis. Laryngoscope. 1970; 80:1414–28.
12. **Fanella S, Singer A, Embree J.** Presentation and management of pediatric orbital cellulitis. Can J Infect Dis Med Microbiol. 2011; 22(3):97-100.
13. **Iftikhar M, Junaid N, Lemus M, et al.** Epidemiology of Primary Ophthalmic Inpatient Admissions in the United States. Am. J. Ophthalmol. 2018;185:101-109.
14. **Hamed-Azzam S, AlHashash I, Briscoe D, Rose GE, Verity DH.** Common Orbital Infections ~ State of the Art ~ Part I. J Ophthalmic Vis Res. 2018;13(2):175-182.
15**. Lindsay RA., Weiss AH., Kelly JP, et al.**Clinical Outcomes in Children With Orbital Cellulitis and Radiographic Globe Tenting.Ophthalmic Plastic & Reconstructive Surgery. 2018; 34(4): 329–332.
16. **Georgakopoulos, C. D., Eliopoulou, M. I., Stasinos, S., et al.** Periorbital and Orbital Cellulitis: A 10-Year Review of Hospitalized Children. European Journal of Ophthalmology 2010; 20(6): 1066–1072.
17. **Ho CF1, Huang YC, Wang CJ, et al.**Clinical analysis of computed tomography-staged orbital cellulitis in children.J Microbiol Immunol Infect. 2007 Dec;40(6):518-24.
18. **Murphy C, Livingstone I, Foot B, et al**. Orbital cellulitis in Scotland: current incidence, aetiology, management and outcomes British Journal of Ophthalmology 2014;98:1575-1578.
19. **Chang YS, Chen PL, Hung JH, et al.** Orbital complications of paranasal sinusitis in Taiwan, 1988 through 2015: Acute ophthalmological manifestations, diagnosis, and management. PLOS ONE 2017; 12(10): e0184477.
20. **Radovani P, Vasili D, Xhelili M, Dervishi J.** Orbital complications of sinusitis. Balkan Med J. 2013;30(2):151-4.
21. **Pereira FJ,, Cruz Antonio AV., Anselmo-Lima WT., et al.** Computed tomographic patterns of orbital cellulitis due to sinusitis. Arq. Bras. Oftalmol.2006; 69(4): 513-518.
22. **Chaudhry IA, Shamsi FA, Arat YO, Riley FC.** Orbital pseudotumor: distinct diagnostic features and management. Middle East Afr J Ophthalmol. 2008;15(1):17-27.
23. **Nugent RA, Rootman J, Robertson WD, et al.** American Journal of Roentgenology 1981; 137(5), 957-962.
24. **Jurdy L, Merks JH, Pieters BR, et al.** Orbital rhabdomyosarcomas: A review. Saudi J Ophthalmol. 2013;27(3):167-75.
25. **Danishyar A, Sergent SR. Orbital Cellulitis.** Treasure Island (FL): StatPearls Publishing; 2019 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK507901/.
26. **Rose GE. Suspicion, speed, sufficiency and surgery: Keys to the management of orbital infection.** Orbit. 1998; 17:223–226.
27. **Clary R, Weber AL, Eavey R, et al.** Orbital cellulitis with abscess formation caused by sinusitis. Ann OtolRhinolLaryngol1988;97:211-212.