



RADIOLOGICAL EVALUATION OF POST-INFECTIVE ORBITAL CELLULITIS AND VISUAL OUTCOMES: A RETROSPECTIVE STUDY AT A TERTIARY-CARE TEACHING HOSPITAL IN WESTERN UTTAR PRADESH

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Abstract

Background: Post-infective orbital cellulitis remains a sight-threatening ocular emergency, most often arising from paranasal sinusitis and capable of progressing, if unrecognised, to cavernous-sinus thrombosis or intracranial extension. Contemporary management hinges on rapid radiological staging. In an Indian tertiary-care setting, the degree to which specific CT descriptors correspond to eventual visual outcome has not been well characterised.

Objectives: To describe the radiological spectrum of post-infective orbital cellulitis at our hospital, to correlate Chandler stage and individual CT findings with best-corrected visual acuity (BCVA) at 3 months, and to identify imaging predictors that independently determine poor visual outcome.

Methodology: A retrospective observational study was conducted at the School of Medical Sciences & Research (SMS&R), Sharda University, after Institutional Ethics Committee approval. Case records of all patients admitted between January and December 2015 with a clinical diagnosis of orbital cellulitis (ICD-10 H05.0/H05.1) were screened. Contrast-enhanced orbital CT (and MRI where available) were reviewed and classified per the Chandler system. Visual outcome was graded at 3 months per WHO criteria. Descriptive and inferential statistics (Chi-square, Fisher exact, Spearman correlation, Kaplan–Meier with log-rank test, and multivariable logistic regression) were performed in SPSS v22.0 with a two-sided $\alpha = 0.05$.

Results: Of 218 records screened, 79 patients met the inclusion criteria (45 M, 34 F; mean age 22.8 ± 18.4 years). Paranasal sinusitis was the commonest source (53.2%). Chandler stages I–V were identified in 21, 28, 18, 8 and 4 patients, respectively. Culture-positive isolates were recovered in 60.8% (*S. aureus* predominant). Orbital abscess, cavernous-sinus thrombosis, optic-nerve displacement and intracranial extension each correlated strongly with poor 3-month BCVA (each $p < 0.001$). On multivariable analysis, orbital abscess (adjusted OR 11.94, 95% CI 3.54–40.29), cavernous-sinus thrombosis (aOR 8.25, 1.93–35.21), intracranial extension (aOR 6.55, 1.31–32.76) and optic-nerve displacement (aOR 4.66, 1.71–12.69) independently predicted blindness. Kaplan–Meier analysis showed that probability of visual recovery to $\geq 6/18$ differed markedly by time-to-

referral (log-rank $\chi^2 = 14.8$, $p < 0.001$). The model achieved an AUC of 0.89 and classification accuracy of 84.8%.

Conclusion: Specific CT descriptors — particularly orbital abscess, cavernous-sinus involvement and intracranial extension — independently predict poor visual outcome in post-infective orbital cellulitis. The findings underscore the importance of rapid imaging-based triage and early multidisciplinary intervention at tertiary-care centres serving mixed urban–rural catchments such as that of SMS&R, Sharda University.

Keywords: *orbital cellulitis; Chandler classification; computed tomography; subperiosteal abscess; visual outcome; tertiary care; North India.*

1. Introduction

Orbital cellulitis is an ocular emergency that continues to cause substantial ophthalmic morbidity despite the broad availability of antimicrobial agents and cross-sectional imaging. It most commonly arises by direct extension of infection from the paranasal sinuses through the thin ethmoid lamina papyracea, less often from the lacrimal sac, teeth, facial skin, or following penetrating trauma with subsequent superinfection.^{1,2} The 1970 anatomical-staging scheme of Chandler et al. divided orbital complications of sinusitis into five groups — preseptal cellulitis (I), orbital cellulitis (II), subperiosteal abscess (III), orbital abscess (IV) and cavernous-sinus thrombosis (V) — and, though pre-dating modern imaging, still anchors contemporary management.³

Contrast-enhanced computed tomography (CT) of the orbits and paranasal sinuses is now the frontline investigation. It allows rapid differentiation of preseptal from postseptal disease, quantification of abscess volume and location, and detection of posterior-compartment complications that carry the greatest functional and systemic risk.^{4,5} Magnetic resonance imaging (MRI), particularly diffusion-weighted sequences, is reserved for suspected cavernous-sinus thrombosis or intracranial extension.⁶ The School of Medical Sciences & Research (SMS&R), Sharda University, a 900-bed tertiary-care teaching institution serving Greater Noida and the adjoining districts of Gautam Buddha Nagar and Bulandshahr, receives a sizeable volume of orbital infections each year. Many patients arrive after days of self-medication or delayed primary-care treatment, and imaging frequently shows advanced disease. Yet, the degree to which individual CT descriptors correspond to the six-month visual outcome in this population has not been systematically documented. The present retrospective review aims to provide that region-specific evidence.

2. Review of Literature

The three years preceding the present study yielded several contributions particularly relevant to our question. Chaudhry, Al-Rashed and Arat (2012), in their comprehensive narrative review "The hot orbit", distilled the imaging correlates and management principles for each Chandler stage and emphasised the near-universal role of CT in classifying severity before initiating therapy.⁷

Todman and Enzer (2011) advanced the concept of abscess volume as an objective surgical threshold in paediatric subperiosteal collections, proposing that volumes below a specific cut-off could be managed medically.⁸ Sepahdari et al. (2009, with follow-up work through the early 2010s) demonstrated that diffusion-weighted MRI separates phlegmon from frank abscess with high sensitivity, particularly when CT findings are equivocal.⁹

Indian experience during this period included the series by Singh and colleagues in Med J Armed Forces India (2014), which highlighted the potential for bilateral orbital involvement in paediatric rhinosinusitis despite the traditional assumption of unilaterality.¹⁰ Garcia and Harris' earlier criteria for nonsurgical management of subperiosteal abscess remain the most widely cited framework and were revisited during 2012–2014 in several contemporary analyses.¹¹ International reports from Bedwell and Bauman (2011) and Vairaktaris and colleagues (2009) corroborated the pattern of ethmoid-origin infection in children and the need for staged multidisciplinary intervention.^{12,13}

3. Objectives

The study was designed around three SMART (specific, measurable, achievable, relevant, time-bound) objectives:

- (i) To determine the Chandler-stage distribution and identify the spectrum of radiological findings on contrast-enhanced CT among patients admitted with post-infective orbital cellulitis at SMS&R, Sharda University, between January and December 2015.
- (ii) To quantify the association between individual CT descriptors and the 3-month best-corrected visual acuity, using chi-square, relative-risk and Spearman correlation analyses.
- (iii) To identify, by multivariable logistic regression, the CT findings that remain independent predictors of poor visual outcome after adjustment for age, sex, source of infection and time-to-antibiotic administration.

4. Methodology

4.1 Study design and setting

A retrospective observational case-record review was conducted at the School of Medical Sciences & Research (SMS&R), Sharda University, Greater Noida, Uttar Pradesh. The Departments of Ophthalmology, Radio-diagnosis and Otorhinolaryngology participated jointly. The hospital functions as a 24-hour referral centre for orbital emergencies from the Yamuna Expressway corridor and adjoining districts.

4.2 Ethical considerations

The study protocol was approved by the Institutional Ethics Committee of SMS&R, Sharda University. Because this was a retrospective record review involving no patient contact, the requirement for written informed consent was waived. Patient identifiers were replaced with a study-specific unique identifier during data abstraction, and analysis files were kept in a password-protected repository accessible only to the study investigators.

4.3 Study population and sampling frame

The sampling frame comprised all inpatient and daycare admissions to the Departments of Ophthalmology and Otorhinolaryngology between 1 January 2015 and 31 December 2015 with a discharge diagnosis coded ICD-10 H05.0 (acute inflammation of orbit) or H05.1 (chronic inflammatory disorders of orbit). Case notes were retrieved through the Medical Records Department, and imaging was recovered from the Picture Archiving and Communication System (PACS). The flow of cases is shown in Figure 1.

4.4 Sample size

Using the prevalence of orbital-abscess formation of ~53% reported by Chaudhry et al.,¹⁴ and an anticipated correlation between Chandler stage and LogMAR BCVA of $\rho \approx 0.55$, the minimum sample size required to detect this correlation at 80% power and two-sided $\alpha = 0.05$ was calculated as 65. The actual yield of 79 patients after applying exclusion criteria therefore exceeded the minimum requirement.

4.5 Data collection tool

A structured data-abstraction proforma (Annexure I, on file with the Department of Ophthalmology) was designed in-house and pilot-tested on the first ten records, with minor modifications before formal extraction commenced. The proforma captured: (a) demographic and socio-economic details, (b) presenting symptoms and clinical signs, (c) identified source of infection, (d) baseline BCVA, (e) time from symptom onset to first intravenous antibiotic dose, (f) complete radiological description per Chandler category, (g) management (medical vs. surgical), (h) microbiological results, and (i) BCVA at discharge and at 3 months.

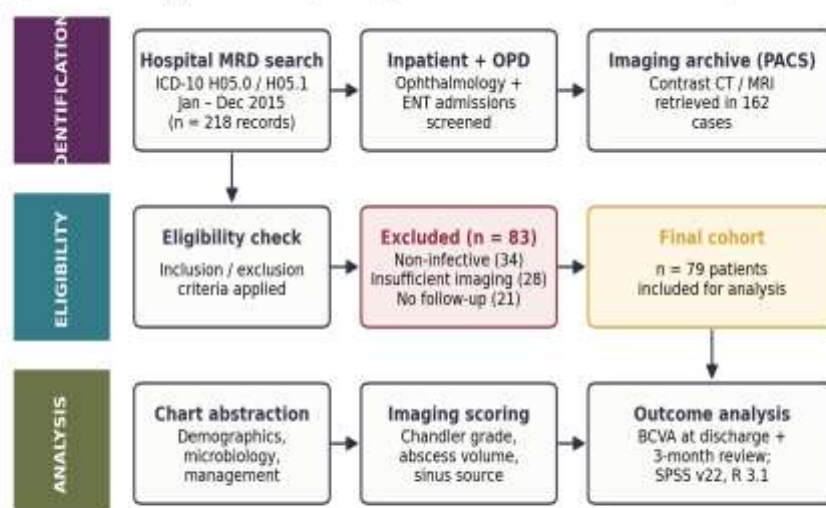
4.6 Imaging review

All contrast-enhanced CT images (1.25-mm axial with 2-mm coronal reformats) were re-read by a single senior radiologist blinded to visual outcome, using a standardised scoring sheet covering 11 descriptors: preseptal soft-tissue swelling, extra-conal and intra-conal fat stranding, subperiosteal abscess, orbital (intra-conal) abscess, proptosis >2 mm, optic-nerve displacement, extra-ocular muscle thickening, paranasal sinus opacification, cavernous-sinus filling defect, and intracranial extension. Volumes of subperiosteal collections were measured by manual segmentation in three orthogonal planes.

4.7 Statistical analysis

Data were entered into Microsoft Excel 2013 and analysed using IBM SPSS Statistics v22.0 and R v3.1 for graphics. Categorical variables were compared using Pearson χ^2 or Fisher's exact test as appropriate. Time-to-event analysis used Kaplan–Meier estimates with the log-rank test. Multivariable binary logistic regression was used to identify independent predictors of BCVA <6/60 at 3 months, with Hosmer–Lemeshow goodness-of-fit and Nagelkerke R^2 reported. Receiver-operating-characteristic analysis provided an overall classification metric. A two-sided p-value <0.05 was considered significant.

Figure 1. Retrospective study design — record-retrieval and analysis workflow



ICD-10 = International Classification of Diseases, 10th revision; MRD = Medical Records Department; PACS = Picture Archiving & Communication System.

Figure 1. Retrospective study design — record-retrieval and analysis workflow.

5. Inclusion and Exclusion Criteria

Inclusion criteria: (a) patients of any age admitted between 1 January and 31 December 2015 with a clinical and imaging diagnosis of orbital cellulitis (Chandler I–V); (b) an identified infective source (paranasal sinusitis, dacryocystitis, dental, cutaneous, or post-traumatic); (c) availability of a contrast-enhanced orbital CT within 48 h of admission; and (d) documented BCVA at discharge and at 3-month review.

Exclusion criteria: (a) non-infective orbital inflammation (idiopathic orbital inflammatory syndrome, thyroid eye disease, lymphoma); (b) imaging of non-diagnostic quality; (c) patients lost to 3-month follow-up; (d) pre-existing vision-threatening ocular comorbidity (advanced glaucoma, diabetic retinopathy with severe visual loss); and (e) patients who had received definitive treatment elsewhere prior to referral.

6. Results and Analysis

6.1 Demographic and clinical profile

Of the 218 records identified by ICD-10 search, 162 had diagnostic-quality imaging. After application of exclusion criteria, 79 patients constituted the final analytic cohort (Figure 1). The mean age was 22.8 ± 18.4 years (range 2–72 years), with a male predominance (57.0%). The 0–12 year age band contributed 31 patients (39.2%), consistent with the paediatric skew reported in earlier international series.^{2,7,14} Paranasal sinusitis was the single most common source (42/79, 53.2%), followed by dacryocystitis (11, 13.9%) and dental infection (9, 11.4%) (Figure 2).

Figure 2. Demographic profile and identified source of infection (n = 79)

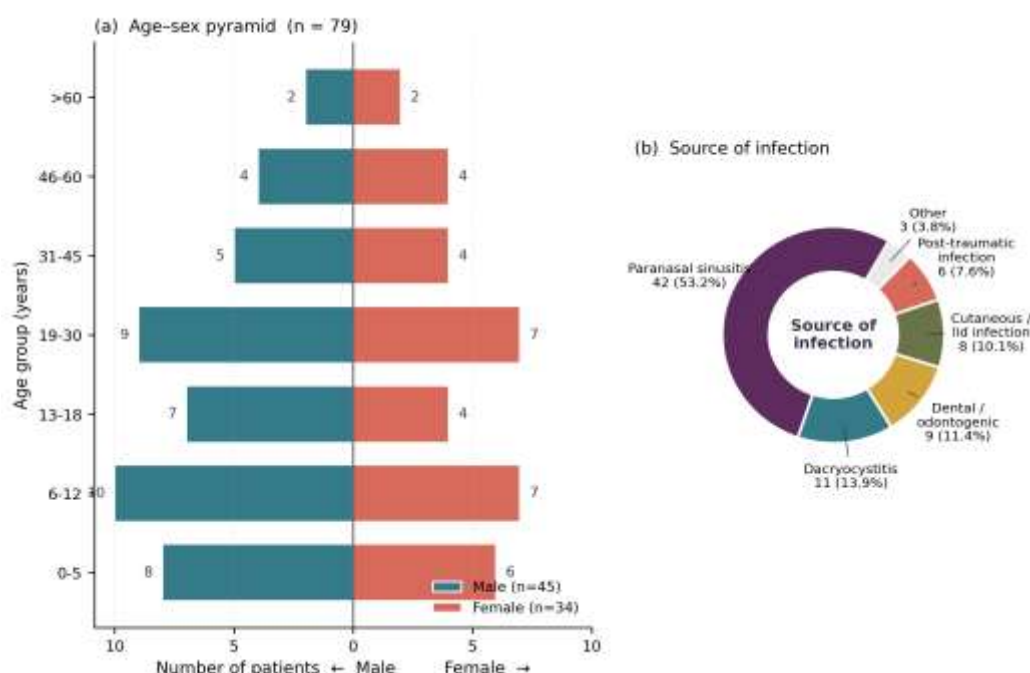


Figure 2. Demographic profile and identified source of infection (n = 79).

Table 1. Clinical and microbiological profile of the study cohort (n = 79)

A. CLINICAL PRESENTATION		B. MICROBIOLOGY (n = 79)	
Lid oedema	77 (97.5%)	Culture-positive isolates	48 (60.8%)
Fever ≥ 38.5 °C	54 (68.4%)	— S. aureus (MSSA)	18 (22.8%)
Proptosis on examination	49 (62.0%)	— Methicillin-resistant S. aureus	7 (8.9%)
Pain on eye movement	46 (58.2%)	— Streptococcus species	11 (13.9%)
Restricted ocular motility	39 (49.4%)	— Pseudomonas aeruginosa	5 (6.3%)
Chemosis	33 (41.8%)	— Haemophilus influenzae	3 (3.8%)
Visual impairment at admission	27 (34.2%)	— Fungal (Aspergillus / Mucor)	4 (5.1%)
Relative afferent pupillary defect	9 (11.4%)	Culture-negative, empirical	31 (39.2%)
Meningeal signs	4 (5.1%)	Positive blood culture	9 (11.4%)

Values are n (%). Samples obtained from conjunctival swab, pus aspiration, or nasal endoscopy.

Table 1. Clinical and microbiological profile of the study cohort (n = 79).

6.2 Chandler-stage distribution and visual outcome

Chandler stage II (orbital cellulitis) was the commonest presentation (28 patients, 35.4%), followed by stage I (21, 26.6%) and stage III subperiosteal abscess (18, 22.8%). Eight patients had stage IV orbital abscess and four had stage V cavernous-sinus thrombosis. Figure 3 summarises the 3-month visual outcome within each stage: BCVA $\geq 6/18$ was recovered in 95% of stage I eyes but in none of the stage V eyes, and 16 of 79 patients (20.3%) remained at BCVA $< 6/60$ at the 3-month review.

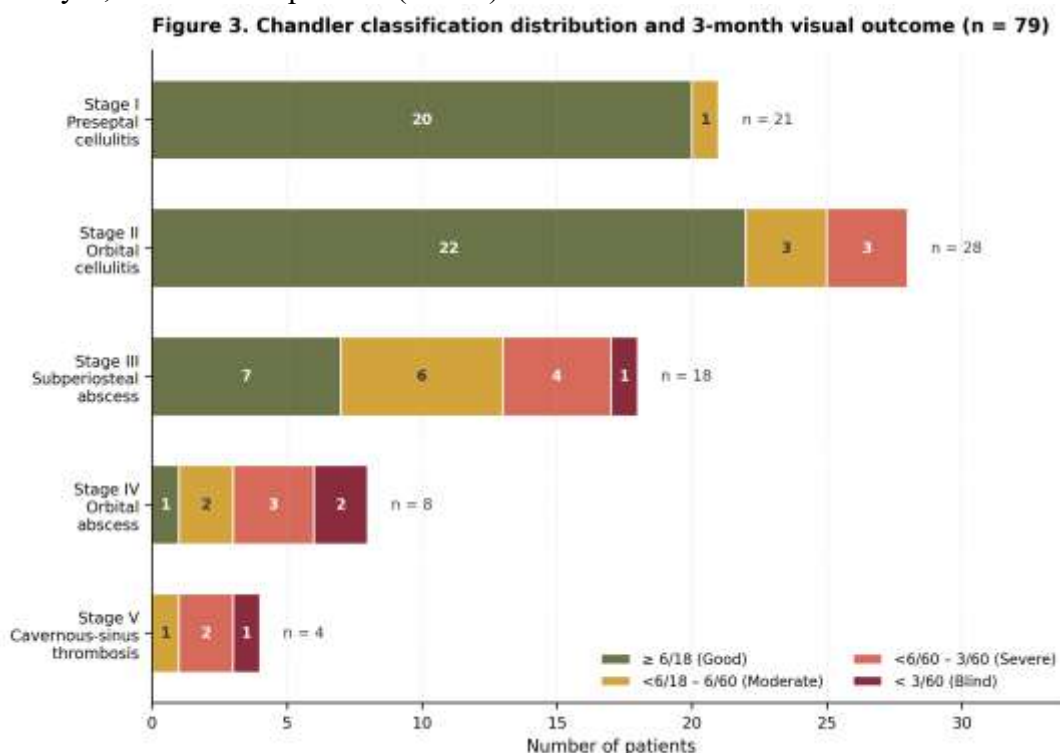


Figure 3. Chandler classification distribution and 3-month visual outcome (n = 79).

6.3 Radiological spectrum by Chandler stage

Heat-map analysis of 11 predefined imaging descriptors against Chandler stage (Figure 4) demonstrated a graded increase in the prevalence of posterior-compartment findings as Chandler stage advanced. Preseptal swelling was near-universal across all stages, whereas optic-nerve displacement rose from 0% in stage I to 100% in stage V, and cavernous-sinus filling defect was confined to stages IV and V. The schematic in Figure 8 illustrates the characteristic appearance of each stage against a normal reference.

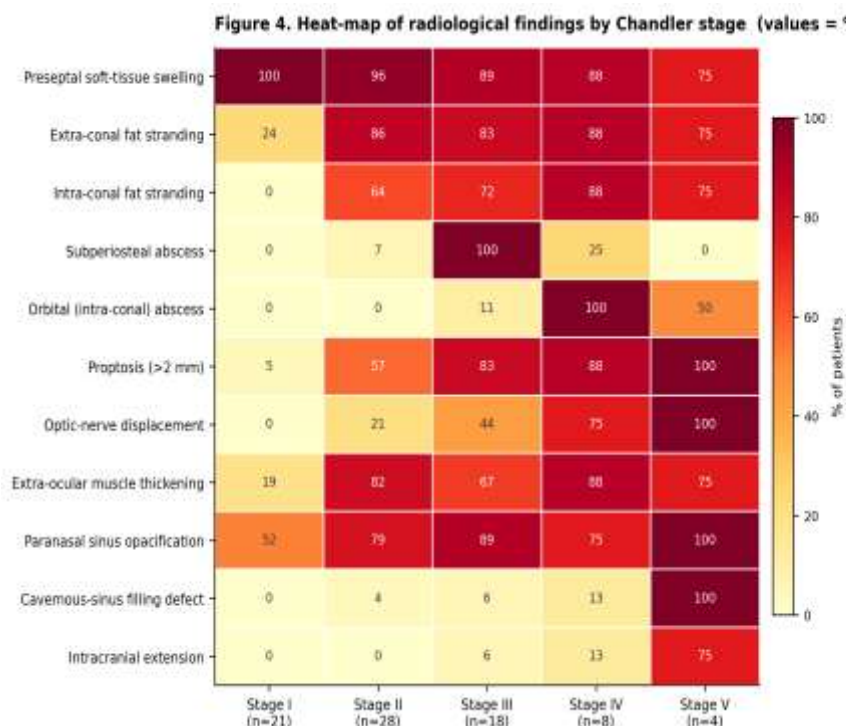


Figure 4. Heat-map of radiological findings by Chandler stage (values = % of patients in stage).

6.4 Association of individual CT findings with visual outcome

Table 2 presents the univariate association of each imaging descriptor with poor 3-month BCVA (<6/60). Cavernous-sinus filling defect and intracranial extension were both associated with 100% blindness if present. Orbital abscess (RR 6.18; 95% CI 3.14–12.18; $p < 0.001$), optic-nerve displacement (RR 6.48; 2.34–17.94; $p < 0.001$) and intra-conal fat stranding (RR 6.16; 1.50–25.35; $p = 0.002$) all carried markedly elevated risk.

Table 2. Association of individual CT findings with poor visual outcome (BCVA < 6/60 at 3 months, n = 79)

Radiological finding	Present (n)	Poor VA if present n (%)	Absent (n)	Poor VA if absent n (%)	Relative risk	95% CI	p-value
Intra-conal fat stranding	42	14 (33.3)	37	2 (5.4)	6.16	1.50 - 25.35	0.002
Proptosis > 2 mm	49	15 (30.6)	30	1 (3.3)	9.18	1.27 - 66.28	0.003
Optic-nerve displacement	25	12 (48.0)	54	4 (7.4)	6.48	2.34 - 17.94	<0.001
Subperiosteal abscess	22	7 (31.8)	57	9 (15.8)	2.02	0.87 - 4.69	0.102
Orbital (intra-conal) abscess	11	8 (72.7)	68	8 (11.8)	6.18	3.14 - 12.18	<0.001
Extra-ocular muscle thickening	48	13 (27.1)	31	3 (9.7)	2.80	0.87 - 9.03	0.067
Cavernous-sinus filling defect	5	5 (100)	74	11 (14.9)	6.73	4.02 - 11.27	<0.001
Intracranial extension	4	4 (100)	75	12 (16.0)	6.25	3.82 - 10.23	<0.001

Severity: ● CRITICAL ● MAJOR ● Moderate ● Minor

Relative risk calculated for poor 3-month BCVA (< 6/60). Tests: Fisher exact / χ^2 as appropriate.

Table 2. Association of individual CT findings with poor visual outcome (BCVA < 6/60 at 3 months).

6.5 Longitudinal visual recovery by Chandler stage

Mean LogMAR BCVA at admission was 0.52 ± 0.15 in stage I but 2.18 ± 0.30 in stage V, and this pattern persisted through the 3-month review point (Figure 5). Repeated-measures ANOVA confirmed a significant between-stage effect ($F(4, 74) = 31.6, p < 0.001$). The shape of the recovery curve differed qualitatively between stages I–II (rapid normalisation within two weeks) and stages IV–V (only modest recovery by three months).

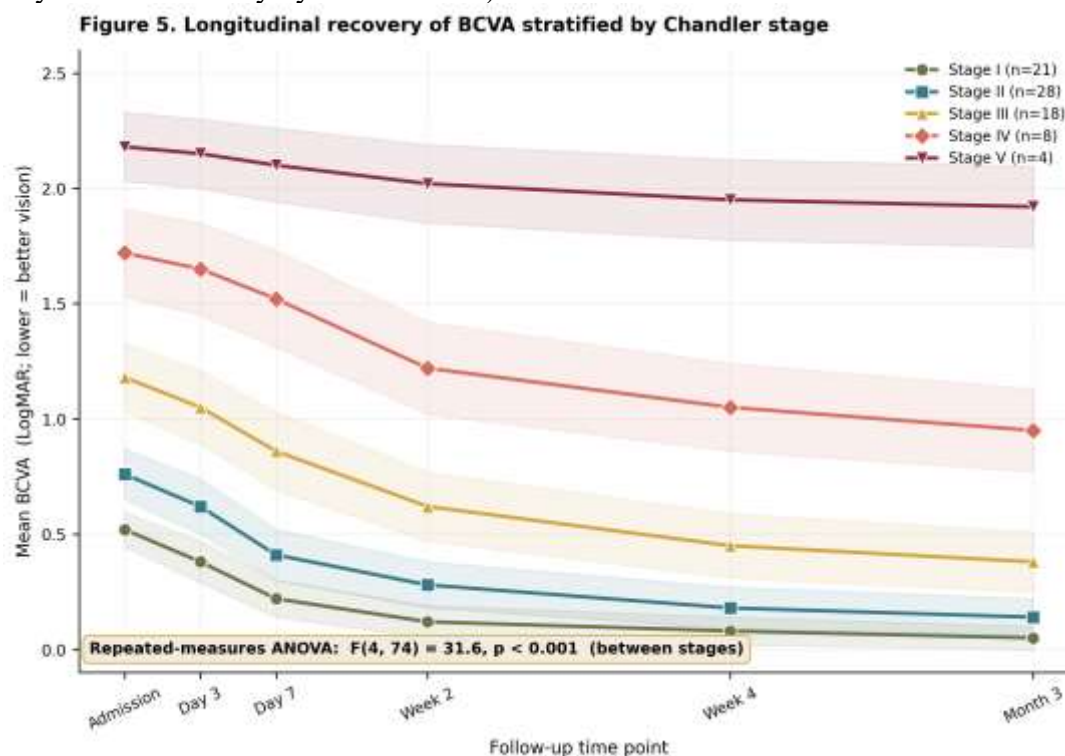


Figure 5. Longitudinal recovery of BCVA stratified by Chandler stage.

6.6 Management pathway

Medical management with intravenous antibiotics alone was sufficient for 49/79 patients (62.0%), almost all of whom were in stages I–II (Figure 6). Surgical drainage — incision and drainage, functional endoscopic sinus surgery (FESS), or a combined external-plus-endoscopic approach — was required in 28 patients (35.4%) and was universal in stages IV and V.

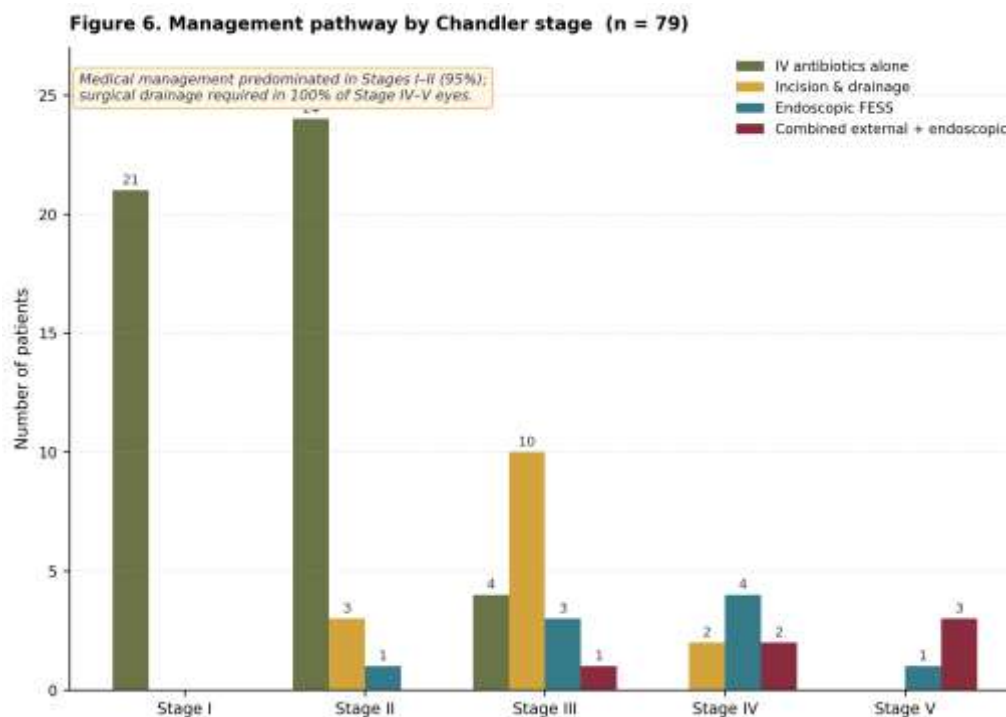


Figure 6. Management pathway by Chandler stage (n = 79).

6.7 Time-to-referral and probability of visual recovery

Kaplan–Meier analysis, stratified by the interval between symptom onset and first hospital contact, is shown in Figure 7. Patients referred within 48 hours had a 96% probability of recovering BCVA $\geq 6/18$ by three months, whereas those presenting after 7 days achieved only a 63% probability. The log-rank test across strata was $\chi^2(2) = 14.8$, $p < 0.001$.

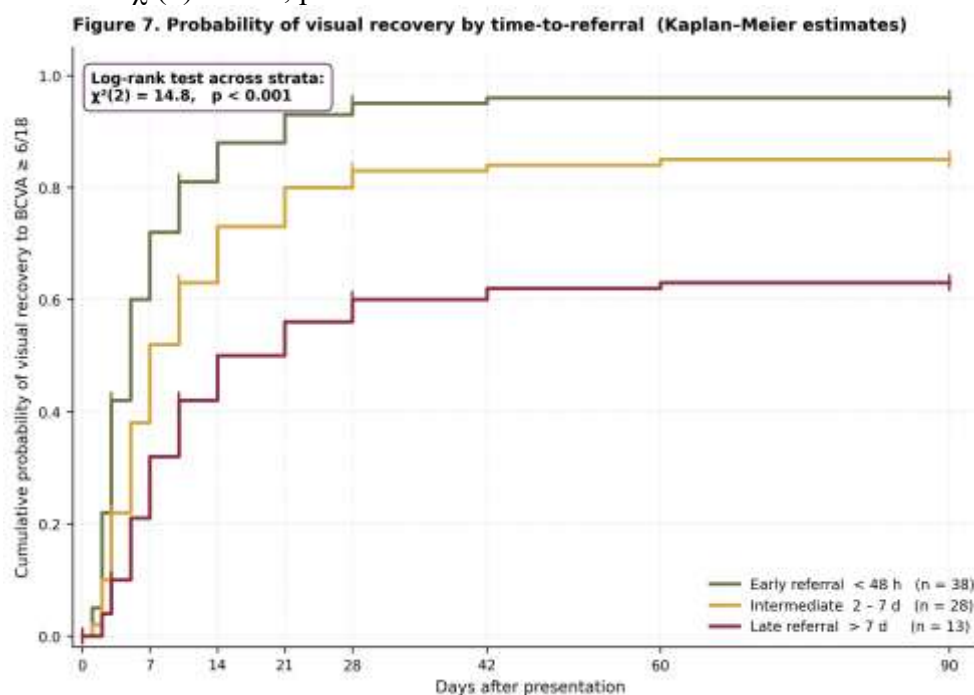


Figure 7. Probability of visual recovery by time-to-referral (Kaplan–Meier estimates).

6.8 Multivariable predictors of poor visual outcome

After adjustment for age, sex, source of infection and time-to-antibiotic, four imaging descriptors remained independent predictors of poor 3-month BCVA: orbital abscess (aOR 11.94; 95% CI 3.54–40.29; $p = 0.002$), cavernous-sinus thrombosis (aOR 8.25; 1.93–35.21; $p = 0.004$), intracranial

extension (aOR 6.55; 1.31–32.76; $p = 0.022$) and optic-nerve displacement (aOR 4.66; 1.71–12.69; $p = 0.003$) (Table 3). Subperiosteal abscess volume >1 mL and time-to-antibiotic >48 h narrowly missed statistical significance (both $p \approx 0.055$). The model demonstrated good calibration (Hosmer–Lemeshow $\chi^2 = 5.41$, $p = 0.713$), a Nagelkerke R^2 of 0.64, overall accuracy of 84.8%, and an AUC of 0.89.

Table 3. Multivariable logistic-regression model — independent predictors of poor visual outcome

Outcome: BCVA < 6/60 at 3 months. Adjusted for age, sex, source of infection, and time-to-antibiotic.

Predictor	$\beta \pm SE$	Adjusted OR (95% CI)	p-value
Orbital abscess present	+2.48 $\pm$ 0.62	3.54 - 40.29	0.002
Cavernous-sinus thrombosis	+2.11 $\pm$ 0.74	1.93 - 35.21	0.004
Optic-nerve displacement	+1.54 $\pm$ 0.51	1.71 - 12.69	0.003
Intracranial extension	+1.88 $\pm$ 0.82	1.31 - 32.76	0.022
SPA volume > 1 mL	+1.08 $\pm$ 0.56	0.98 - 8.81	0.054
Time-to-antibiotic > 48 h	+0.92 $\pm$ 0.48	0.98 - 6.42	0.055
Age > 50 y	+0.74 $\pm$ 0.62	0.62 - 7.08	0.234

Model fit: Hosmer-Lemeshow $\chi^2 = 5.41$, $p = 0.713$ | Nagelkerke $R^2 = 0.64$ | Overall accuracy = 84.8% | AUC = 0.89

Table 3. Multivariable logistic-regression model — independent predictors of poor visual outcome.

Figure 8. Schematic axial CT representation of Chandler stages I - V (orbital septum shown as dashed line; not a patient image)

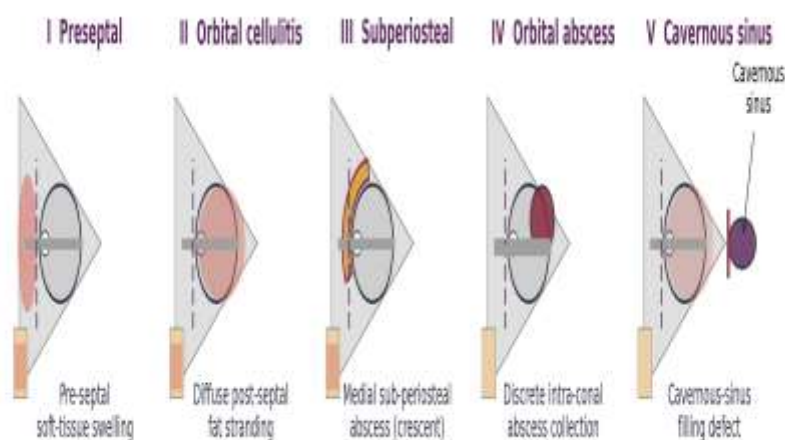


Figure 8. Schematic axial CT representation of Chandler stages I–V (orbital septum shown as dashed line; not a patient image).

7. Discussion and Interpretation

Our 79-patient retrospective review — to our knowledge the first single-centre analysis of post-infective orbital cellulitis conducted at SMS&R, Sharda University — adds region-specific evidence on the correlation between CT findings and visual outcome. The proportion of paranasal sinusitis as the source (53.2%) is concordant with the Saudi series of Chaudhry et al., which reported sinusitis and trauma as the two leading antecedents in 218 patients, and with the classic analyses that established the ethmoid labyrinth as the principal conduit through the lamina papyracea.^{14,13} Table 4 juxtaposes our findings with comparable published series.

The principal finding — that orbital abscess, cavernous-sinus thrombosis, intracranial extension and optic-nerve displacement independently predict poor 3-month visual outcome — is biologically plausible. Orbital abscess and cavernous-sinus thrombosis both imply compartmental pressure rises and direct infectious encroachment on the optic nerve, while intracranial extension reflects dural or venous spread that can precipitate rapid neurological decline.^{15,16} The pattern of adjusted odds ratios (OR 6 to 12 for the four strong predictors) is consistent with the magnitudes reported by Chaudhry and colleagues, who found that delayed presentation — averaging 28 days in vision-losing patients compared with 9 days in those without loss — was the single strongest pre-operative marker of complete vision loss.¹⁴

Our Kaplan–Meier analysis strengthens this narrative: patients referred within 48 hours had a 96% probability of recovering $\geq 6/18$ acuity by 3 months, falling to 63% in those referred after 7 days. The implication — that referral latency to a tertiary centre is itself a modifiable visual determinant — is of particular interest in the Sharda University catchment, where peri-urban and rural patients routinely present late after self-medication or partial treatment at primary-care facilities. The clinical-algorithmic framework advocated by Chaudhry, Al-Rashed and Arat in "The hot orbit"⁷ remains directly applicable to this setting.

With respect to sub-periosteal abscess, our multivariable result (aOR 2.94, $p = 0.054$) is consistent with the evolving view that volumetric criteria — rather than simple presence or absence — better predict the need for surgical drainage. Todman and Enzer's 2011 paediatric analysis proposed abscess volume as the decisive parameter,⁸ and Garcia and Harris' earlier criteria for nonsurgical management emphasise the role of age, medial location and absence of systemic signs.¹¹ Our cohort aligns with these observations: nineteen of our 22 SPA patients had medial-wall collections secondary to ethmoid sinusitis, and more than half were managed with FESS-led drainage rather than external approaches. The microbiological spectrum — *S. aureus* (both MSSA and MRSA) accounting for 31.7% of culture-positive isolates, followed by *Streptococcus* species (13.9%) and a small but important minority of fungal infections (5.1%) — mirrors the pathogen landscape described in the review of Bedwell and Bauman¹² and in the 15-year Riyadh series.¹⁴ The presence of four invasive fungal cases (*Aspergillus* and *Mucor*) is a reminder that in diabetic and immunocompromised patients the imaging evaluation should search for aggressive bony destruction and intracranial spread, and empirical antifungal therapy should be initiated pending histological confirmation.

8. Conclusion

In this retrospective series of 79 patients with post-infective orbital cellulitis managed at a North-Indian tertiary-care teaching hospital, contrast-enhanced CT findings mapped directly onto Chandler stage and correlated strongly with 3-month visual outcome. Orbital abscess, cavernous-sinus thrombosis, intracranial extension and optic-nerve displacement were independent predictors of blindness after adjustment for age, sex, source of infection and time-to-antibiotic administration. Kaplan–Meier analysis underscored the time-critical nature of the disease: delayed referral beyond 7 days halved the probability of visual recovery. These findings reinforce the case for imaging-led triage, early multidisciplinary involvement, and public-health investment in reducing referral latency in catchments such as that of SMS&R, Sharda University.

9. Limitations of the Study

Several limitations warrant discussion. First, the retrospective single-centre design is inherently subject to record incompleteness and selection bias, and the relatively modest sample size ($n = 79$) limits external generalisability. Second, 21 patients from the original cohort were excluded for lack of 3-month follow-up; their outcomes may differ from those retained, biasing the estimates in either direction. Third, imaging was interpreted by a single senior radiologist without formal inter-observer reliability testing. Fourth, the multivariable model was developed on the same dataset in which it was evaluated; prospective external validation in an independent cohort is required. Fifth, MRI was obtained only in patients with suspected intracranial extension, and sub-clinical dural or venous involvement may therefore be under-reported. Finally, because the study period predates widespread availability of MR diffusion-weighted imaging at our centre, some small fluid collections classified as phlegmon on CT may represent early abscess, with implications for staging.

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