Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 01, 2024

Original research article

INTRAOPERATIVE FROZEN SECTION IN DIAGNOSING ACUTE INVASIVE FUNGAL RHINOSINUSITIS

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Abstract

Acute invasive fungal rhinosinusitis (AIFRS) is a life threatening infection inspite of aggressive multimodal therapy which includes extensive surgical debridement of nose and paranasal sinuses, orbital exenteration, and antifungal therapy. The most commonly observed fungi are Aspergillus and Mucor. Because of the increase in AIFRS in post-COVID-19 patients after the second wave, the present study is based on a comparison of intraoperative frozen sections with standard conventional histopathology to assess the sensitivity and specificity of frozen sections and to standardize the technique to aid in the diagnosis of fungal sinusitis. AIFRS needs aggressive and extensive, sometimes disfiguring surgical debridement followed by chemotherapy with toxic fungal drugs to save the patient's life. Hence, an early accurate diagnosis is highly useful.

Keywords: Frozen section, sinusitis, fungus

Introduction

AIFRS is characterized by inflammation of nasal and paranasal sinus mucosa with an increase in the number of transplants, usage of antibiotics and chemotherapeutical drugs, and in immunocompromised patients which is frequently seen where it occurs in two forms - noninvasive and invasive FRS. In immunocompromised patients, it is frequently associated with frequent mortality [1].

AIFRS is a lethal and rapidly progressive disease. There is a sudden surge of fungal

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 01, 2024

infections in post-COVID patients, especially with Mucormycosis. Diagnostic delay is a factor that has frequently been associated with poor outcomes in these patients. As conventional histopathology takes 4-5 days or more if a bony tissue needs to be decalcified. Microbiologic isolation from the tissue samples takes time and is not always successful [2, 3, 4]. Therefore, Intraoperative frozen section diagnosis will help in early surgical intervention followed by treatment with medical management with drugs like Amphotericin [5, 6]. Most of the previous studies were retrospective and done with less sample size. The present study intends to compare frozen section results with conventional histopathology sections to standardize the procedure to determine the accuracy. Intraoperative margin assessment is useful during rhino sino orbital fungal infections when delicate structures like orbit can be saved [5]. This is an institutional experience with an emphasis on the role of frozen section diagnosis in the intraoperative and postoperative diagnosis of AIFRS.

Materials and Methods

Institutional Review Board approval was obtained. Frozen section samples received from operation theatre embedded in optimal cutting temperature and allowed to freeze in a cryostat at an approximate temperature of - 20 degrees centigrade. Sections were prepared using Leica Biosystem at a thickness of approximately 5 µm across two differential levels. After that, the frozen section was thawed, fixed in formalin, and processed for permanent sections. Both frozen sections and routinely processed sections were stained with Hematoxylin and Eosin and fungal stains periodic acid Schiff's (PAS) stain, Gomori -methenamine silver was done. The sensitivity and specificity, positive predictive value, negative predictive value was assessed with the frozen section as a fixed test method and the permanent methods as gold standard methods.

Results

The total number of frozen biopsies studied was 106 which belong to 88 patients with a provisional diagnosis of fungal sinusitis. All the patients are treated for SARS-COVID 19 infection previously. The number of frozen samples in which fungal hyphae were identified was 96 and 10 samples were negative for fungal hyphae. On conventional histopathology sections, all 96 samples positive on frozen sections revealed fungal hyphae. Of the 10 negative samples on the frozen section two had fungal elements in conventional H and E sections. In 93 samples it was Mucormycosis and 2 patients had mixed infection with Aspergillus and Mucor and 1 patient had Aspergillus infection. 18 patients underwent orbital exenteration and 31 patients underwent mandibulectomy.

Discussion

AIFRS is a fulminant life threatening infection which needs to be treated very early and aggressively to prevent morbidity and mortality. This needs a definitive diagnosis for prompt and timely intervention for which frozen section is themost important available option today. A considerable number has to be studied to incorporate frozen section diagnosis into the diagnostic modalities for fungal diagnosis. As there is a recent increase in AIFRS in post-COVID patients this study could be done on significant

ISSN:0975 -3583,0976-2833 VOL 15, ISSUE 01, 2024

sample size. Most of the previous studies involved routine conventional histopathological examination or fungal cultures which took a considerable period. In the present study 96 samples that demonstrated fungus on the frozen section also proved to be positive on conventional histopathology sections. Out of the 10 negative specimens only 2 had fungal hyphae on routine histopathology sections. The reason could be the extensive tissue necrosis and hemorrhages in these sections. The 8 specimens which were negative for fungal elements on frozen sections and conventional histopathology, patients had allergic sinusitis and given their post COVID status were suspected to have AIFRS. They were followed up and none of them had symptoms after routine management.

Papagiannopoulou *et al*. [8] retrospectively reviewed frozen sections and histopathology of 18 patients and reported a sensitivity of 72.7% and specificity of 100%.This is a retrospective studyon patients with a final histopathology diagnosis of AIFRS. Melaucon *et al*. [9] studied 28 patients in whom 21 had a final diagnosis of AIFRS. Frozen sections had 87.5% sensitivity and 100% specificity. This is a retrospective study. In our study, the sensitivity of frozen sections is 90.5% and specificity is 100%. Case series on the role of frozen sections by Taxy *et al*. [1] and Ghadiali *et al*. [2] have shown 62.5% and 84% sensitivity respectively. The study by Ghadiali *et al*. involved 20 patients with fungal rhinosinusitis over a 12 year period out of which 11 are infected with Mucor species and 9 with Aspergillus.

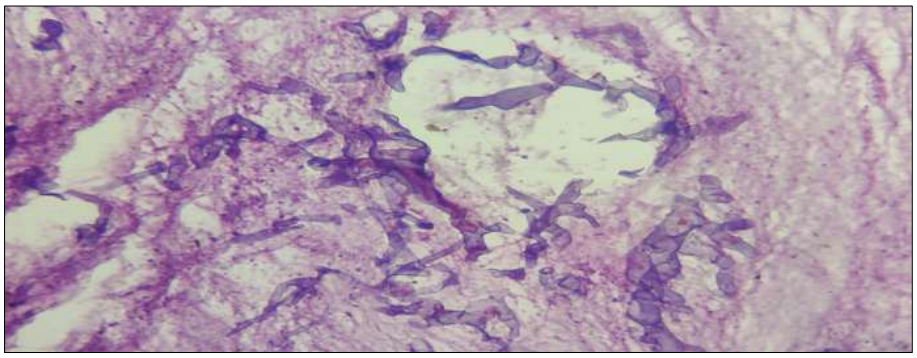

Fig 1: Angioinvasion mucor

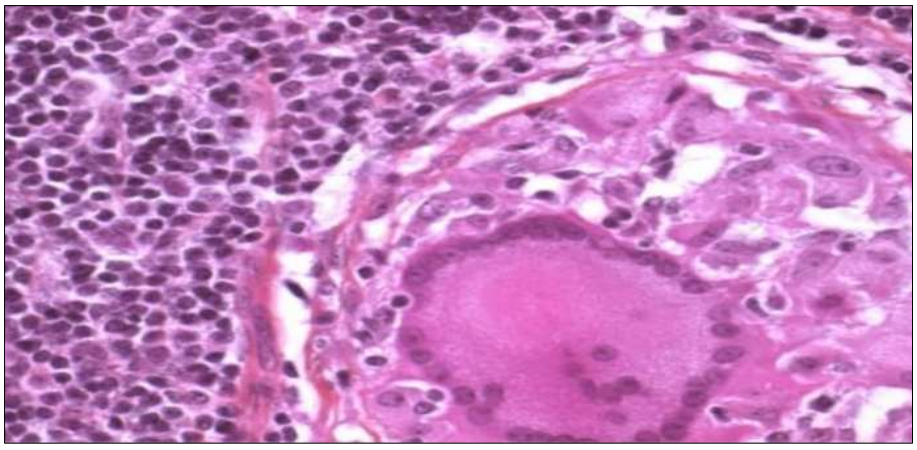

Fig 2: Foreign body granuloma

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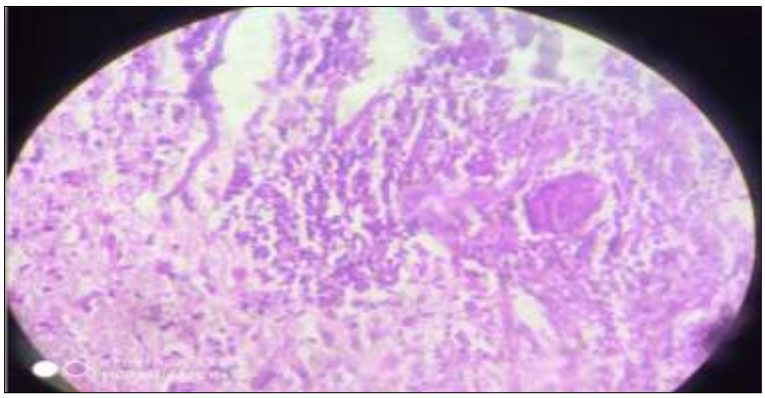

Fig 3: Foreign body giant cell with engulfed fungal hyphae

Conclusion

There is an increase in AIFRS in post COVID patients especially with Mucormycosis. The decision to treat these cases with such aggressive surgical debridement and antifungal agents needs an early definitive diagnosis. Hence, there is a need to include frozen section diagnosis in the protocol. As surgical debridement procedure is an emergency and involves radical resection of paranasal sinus tissues and sometimes orbital exenteration, frozen sections under these circumstances play a major role. The present study with 100% specificity emphasizes that frozen section diagnosis plays a major role in the management of AIFRS and helps to save the patient's life and to avoid multiple re-explorations. It also helps to avoid unnecessary surgical intervention and the patients being subjected to toxic antifungal drugs for benefit of the doubt.

Conflict of interest: None.

Funding Support: Nil.

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