



“Fizz Sign” in Acute Sinusitis—A CT Scan Finding

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Abstract To study the Computerized Tomography (CT) Paranasal Sinus findings in patients with acute bacterial sinusitis and the clinical symptom associated with it. 120 patients were examined over 2 years with coronal CT images of paranasal sinus with clinical symptoms of acute sinusitis of 2 weeks duration from the onset. Patients with symptoms of more than 2 weeks and patients with chronic sinusitis, immunocompromised status were excluded. Air mixed with fluid is seen like a Fizz of cola drink within the maxillary, frontal or sphenoid sinus, mucosal thickening of more than 5 mm, fluid level and presence of opacifications were used as evidence of acute sinusitis. 28 patients (23.3%) had Fizz sign (Air mixed with fluid seen as bubbles) coronal CT images of the paranasal sinus. The study demonstrated great variation in the CT paranasal findings amongst patients with suspected acute sinusitis. More than

one sinus subsite was affected amongst patients in whom acute sinusitis was confirmed by CT Paranasal sinus imaging. We hereby highlight a new sign of air mixed with fluid which the senior author had named as Fizz Sign because of its resemblance to the fizz of dark cola drink.

Keywords Acute sinusitis · Fizz sign · CT scan · Paranasal sinus

Introduction

Acute sinusitis is a common medical condition in General and ENT practice. Acute sinusitis is usually diagnosed based on symptoms and signs. It is confirmed with diagnostic nasal endoscopy (DNE) and Computerized tomography of Paranasal sinus (CT scan). CT Paranasal sinus scan is a noninvasive method of diagnosing sinusitis [1]. CT is the most accurate methods for demonstrating pathology in the paranasal sinuses (Gold standard investigation). CT is superior to conventional radiography in the assessment of sinus pathology, as it gives more detailed information about all sinus subsites. CT has so far been used mostly in preoperative assessment. As technology becomes more available & widespread, CT paranasal sinus scan is also used to a greater extent in evaluating patients with sinus disease in General and ENT practice [2, 3]. The purpose of CT scan here is to describe the findings amongst patients clinically diagnosed with acute sinusitis presenting with headache or facial pain. The usual CT findings in Acute sinusitis are fluid level, mucosal thickening and partial or complete opacification. Here the senior author describes the CT findings as “FIZZ sign”.

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Material and Methods

A Cross sectional study, amongst 120 patients aged 18–55 years over 2 years from January 2018 to November 2019 were selected in the study with minimum 2 major criteria or 1 major and 2 minor criteria of sinusitis. 120 patients were examined with coronal CT images of the paranasal sinuses with clinical symptoms of acute sinusitis up to 2 weeks from the onset. Inclusion criteria were patients with clinical symptoms of acute sinusitis which required medical management. Exclusion criteria were children, pregnant women, and immunocompromised patients, on-going or post medical management, past history of sinus surgery.

CT Evaluation

CT Paranasal sinus was suggested with 2 mm cuts coronal imaging through the anterior part of the sinus complex, thereafter with 5 mm cuts in sections through the posterior part. The entire nasal cavity and all the paranasal sinuses were included. A bone algorithm was used and the films were evaluated with a window width of 3000 Hounsfield unit (HU) and a level of 300–350 HU. The sinus systems evaluated were the frontal, ethmoid, maxillary and sphenoid sinuses, divided in to left and right sided groups with a total of 8 subsites. Evaluation of the sinuses included the following:

- Presence of opacifications: partial or complete.
- Mucosal thickening (Mucosal thickening of 5 mm or more was considered) along the margins in air-filled sinuses.
- Fluid levels

- Fizz Sign, a significant and classical sign of sinus involving maxillary, frontal and sphenoid sinuses.

In the ethmoid sinus, this sign doesn't apply due to the small size of the ethmoid cells. Therefore the distinction between partial and total opacification was used concerning ethmoid sinus subsite.

Presence of fluid level is defined as an opacification with a horizontal level between fluid and air in the sinus. The main purpose of observation in CT scans was to evaluate the percentage of FIZZ sign in acute sinusitis. In the analysis, the patients were divided into 3 main groups according to the degree of maxillary, frontal and sphenoid sinus involved.

Group 1–Fluid level.

Group 2–mucosal thickening of 5 mm or more in any sinus.

Group 3–FIZZ sign (air mixed with fluid).

Results

A Cross-sectional study, amongst 120 patients aged 18–55 years over 2 years from January 2018 to November 2019 were selected in the study with minimum of 2 major criteria or 1 major and 2 minor criteria of sinusitis. Out of 120 patients, 72 were male and 48 were female. 28 patients (23.3%) had Fizz sign (Air mixed with fluid seen as bubbles) positive (Figs. 1, 2a–e). Isolated sinus was noted in 19 (68%) and combined was 9 (32%). The maxillary sinus was most frequently affected, followed by sphenoid and frontal sinuses. In 23.3% of cases, we observed a new finding in Coronal CT Scans which hasn't been described earlier. It is

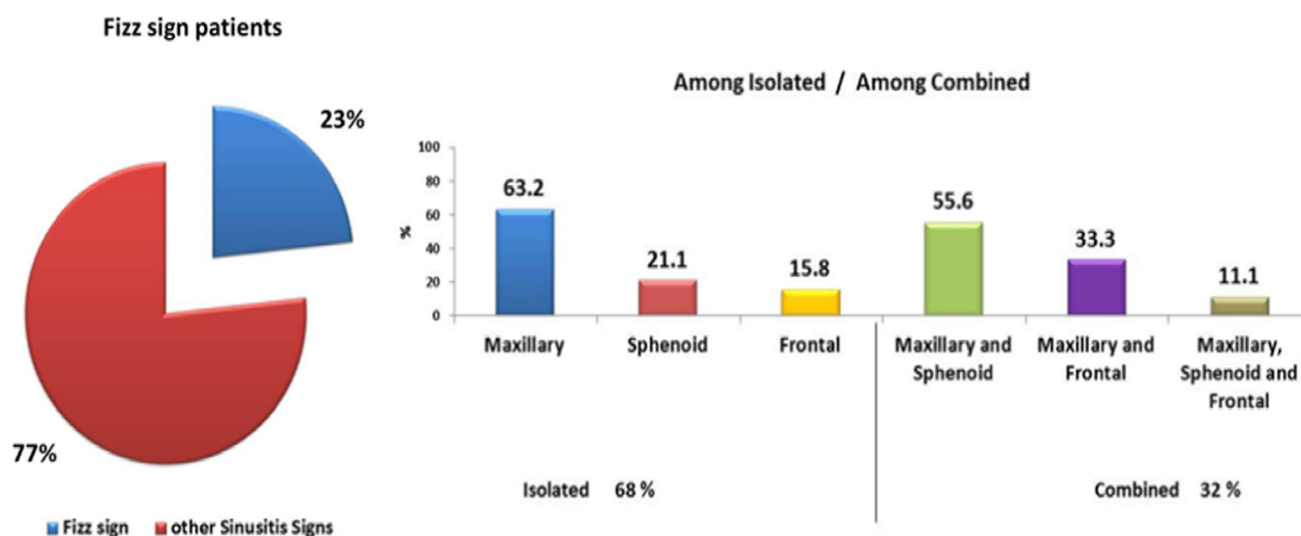


Fig. 1 Statistical analysis of fizz sign and distribution of fizz sign in each sinus

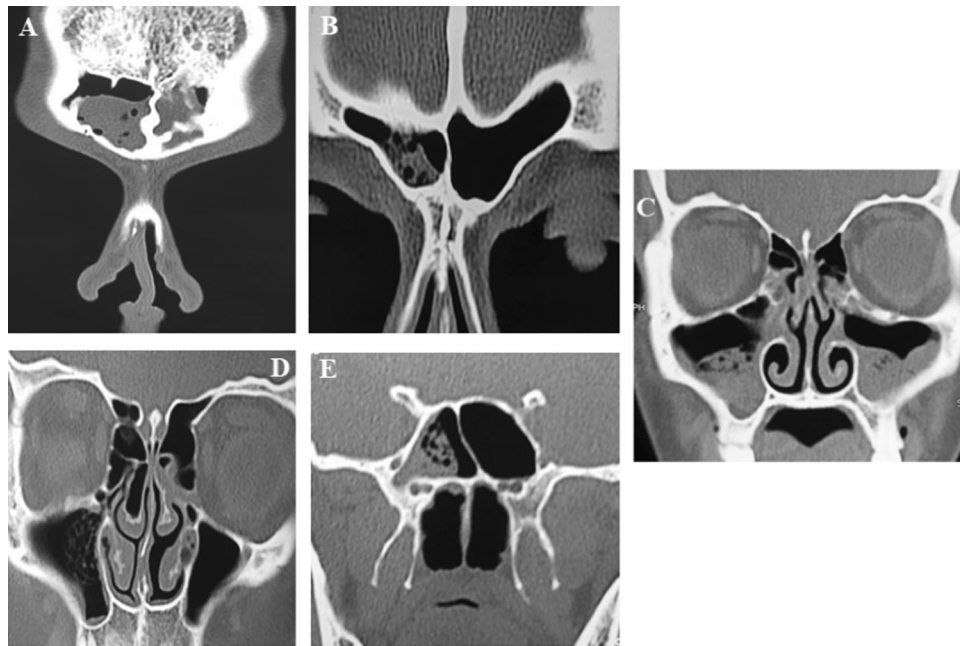


Fig. 2 CT Scan images of Paranasal sinus (a–e). **a** CT scan image showing Bilateral Frontal sinus FIZZ sign. **b** CT scan image showing Right Frontal sinus FIZZ sign. **c:** CT scan image showing Bilateral Maxillary sinus FIZZ sign. **d** CT scan image showing Right Maxillary sinus FIZZ sign. **e** CT scan image showing Right Sphenoid sinus FIZZ sign

air mixed with fluid seen as bubbles, like the Fizz of the black cola drink.

Discussion

Rhinosinusitis is defined as symptomatic inflammation of the paranasal sinuses and nasal cavity. It is classified by duration as acute rhinosinusitis (ARS) if less than 4 weeks duration or as chronic rhinosinusitis (CRS) if lasting more than 12 weeks, with or without acute exacerbations. ARS may be classified further based on the aetiology, symptoms and duration of acute bacterial rhinosinusitis (ABRS) or viral rhinosinusitis (VRS) [4]. Clinical diagnosis of acute sinusitis is made if the symptoms and signs last for up to four weeks. Major criteria include purulent anterior or postnasal discharge, nasal congestion or obstruction, facial congestion or fullness, facial pain, fever and hyposmia or anosmia. Minor criteria include headache, ear pain or fullness, halitosis, dental pain, cough and fatigue [1, 5].

Predominantly CT Paranasal sinus scan amongst asymptomatic patients is mucopurulent thickening, thereby raising doubts on its true clinical significance. CT-scan findings of Air fluid levels or opacifications are uncommon in asymptomatic patients [6]. Conventional X-ray Paranasal sinus radiography has low sensitivity for detecting sinus inflammatory changes in the frontal, ethmoid and sphenoid sinuses. CT has been generally accepted as the

most reliable imaging method for the detection and localization of sinus opacifications [7].

The reliability and value of these plain X ray-film findings have been questioned by several recent reports. Significant paranasal sinus disease, including sinusitis, has been found despite normal plain films when compared with the radiographic criterion standard of computed tomography (CT) [8]. Medical management is recommended as the first-line management of acute bacterial sinusitis to achieve a more rapid clinical cure [9]. Complications of acute bacterial sinusitis should be diagnosed when the patient develops signs or symptoms of orbital and/or intracranial involvement. Rarely, complicated acute bacterial sinusitis can result in permanent blindness, other neurologic sequelae, or death if not treated promptly and appropriately [10].

Dr. Ahila's Fizz Sign is a finding in CT paranasal sinuses in acute sinusitis. CT paranasal sinus appearance is similar to the fizzy foamy part of a cola drink which is very classically noted in acute infection of maxillary, sphenoid and frontal sinuses. In acute bacterial sinusitis, the ostia will be partially blocked due to mucosal edema and the infective aerobic and anaerobic bacteria constantly produces hydrogen and methane which forms bubbles within the inflamed sinuses producing mucopurulent secretion. Mostly the sinuses are half-filled with air and the rest half filled with secretion and air bubbles resembling the Fizz of a cola drink, a characteristic appearance in CT paranasal

sinuses. This sign helps to treat patients with acute sinusitis medically and surgical intervention is not required. Most often on clinical history, a fizz like crackles in the sinuses is felt by the patient after blowing the nose. The sinus mucosa will be thin and not thick and edematous like chronic sinusitis due to pressure by the gas in the sinuses which is again classical of acute sinusitis.

Conclusion

This study demonstrated great variation in the CT Paranasal sinus findings in patients with suspected acute sinusitis. More than one sinus subsite was affected in patients with sinusitis, later confirmed by CT imaging. Here we highlight a radiological sign of air mixed with fluid, which the senior author has named as “Fizz Sign”, because of its resemblance to the fizz of dark cola drink. This sign helps to treat them medically and surgical intervention is often not needed.

Author Contributions *Ahilasamy Nagalingeswaran* is the major contributor to the inception of the radiological sign. *Veerasingamani Narendrakumar* Analysis of manuscript. *Rajendran Dinesh Kumar* Corresponding Author & Analysis, Review and Final editing of the manuscript. *Sivaprakasam Rajasekaran* Contribution in preparation images and supporting material. *Niharika R* Review of the Literature and manuscript. *Lavanya M* Review of the Literature and manuscript. All authors read and approved the final manuscript.

Declarations

Conflict of interests The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from individual participant included in the study.

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