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# A STUDY OF RADIOLOGICAL AND PATHOLOGICAL CORRELATION OF SUBMANDIBULAR GLAND SIALODENITIS

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**ABSTRACT** **AIM:** To evaluate use of MR imaging in depicting wide variety of pathologic changes of the salivary gland in sialolithiasis.

**METHODS:** it was a hospital based prospective study in which Twelve patients with sialolithiasis of the submandibular gland underwent MR imaging. MR imaging features then were compared with clinical symptoms, histopathologic features of excised glands, and CT imaging features.

**RESULTS:** Submandibular glands with sialolithiasis could be classified into three types on the basis of clinical symptoms and MR imaging features of the glands. Type I glands were positive for clinical symptoms and MR imaging abnormalities, and were characterised histopathologically by active inflammation (9 [56%] of 16). Type II glands were negative for clinical symptoms and positive for MR imaging abnormalities (4 [25%] of 16), and the glands were replaced by fat. Type III glands were negative for clinical symptoms and MR imaging abnormalities (3 [19%] of 16). CT features of these glands correlated well with those of MR imaging.

**CONCLUSION:** These results suggest that MR imaging should be used along with CT in examining glands with sialolithiasis.

**Keywords :** MRI Sialolithiasis, Radiology

## INTRODUCTION-

Any disease or tumour, which obstructs the salivary duct, may cause sialoadenitis. Sialolithiasis most commonly occurs in the submandibular glands at a rate reportedly fluctuating between 80% and 95% (1, 2). Imaging diagnoses are performed primarily by plain radiography in order to assess the number, location, and size of sialoliths. Conventional sialography may be performed to examine the state of the duct, which may be dilated or of normal appearance. In cases of large sialoliths, the proximal portion is not visible owing to complete obstruction. It is not uncommon for sialography to reveal a non- or partially calcified sialolith in the duct. None of the above methods, however, can enable reliable assessment of the state of gland parenchyma affected by sialolithiasis; they can suggest merely the state. MR imaging has been proved useful in the diagnosis of several diseases of the salivary glands, including benign and malignant tumors, Sjögren's syndrome, and infections (3–6). Therefore in this study, we evaluated the MR features of the submandibular gland affected by sialolithiasis and correlated these changes with clinical symptoms and histopathologic features of excised glands.

## MATERIAL AND METHODS-

This was a hospital based retrospective observational study in which a total of twelve patients with sialolithiasis of the submandibular gland (eight women and four men; average age, 48 years; age range, 18–68 years) were studied prospectively by MR imaging. The patients were selected by plain radiographic examination, which demonstrated a solitary or multiple calcified sialolith-like structure in the submandibular region. At the initial examinations, seven of the 12 patients complained of clinical symptoms such as pain and swelling very suggestive of sialolithiasis, but the remaining patients did not show these symptoms. The presence of sialoliths in the asymptomatic patients was found incidentally by radiographic examinations for other reasons such as mandibular diseases and dental caries. These patients had no history of disease or receiving drugs such as corticosteroids that could affect the salivary gland function. The presence, location, and size of the sialoliths were confirmed by CT examinations. The patients were divided into three groups on the basis of clinical symptoms such as pain and swelling. MR imaging was performed on the affected glands and comparison was done with healthy gland on the opposite side of the same patient. MR and CT images were obtained from all twelve patients and then surgery was performed on all twelve patients.

## RESULTS-

Based on the clinical symptoms, sialolithiasis of the submandibular gland could be categorised into three types (Table 1). Clinical symptoms related to sialolithiasis were noted only in the type I patients. Patients of the other two types had no symptoms and no history of symptoms. CT of twelve patients was performed and findings are as shown in (table 2). MR imaging of the twelve patients was performed and findings are shown in (table 3). The interval between the onset of symptoms and the timing of MR imaging ranged from 1 week to 5 months (average interval = 6.8 weeks), and there was no difference in MR imaging findings among the patients with relatively short (less than 1 month) and those with longer (over 1 month) intervals.

## DISCUSSION-

Bacterial and viral infections are among the most common causes of sialoadenitis. Bacterial infections commonly ascend from the oral cavity because of decreased salivary flow. We have described the MR imaging spectrum of sialoadenitis associated with sialolithiasis of the submandibular gland, and classified the affected glands into three types based on the MR imaging features and clinical symptoms. The type I pattern indicates the presence of active inflammation of the glands and is associated with decreased signal intensities on T1-weighted images, with concomitant increased signal intensities on fat-suppressed T2-weighted and STIR images. Increased gland size, which was present in half of the patients in the type I group, and symptomatic glands, which were present in all patients of this group, indicate that these glands were in active states of inflammation (1). We performed histopathologic analysis of the affected glands from three patients (patients 1, 7, and 9) categorised as type I. Of these patients, two glands (patients 1 and 7) demonstrated active inflammation and supported the view that the type I glands were associated with active inflammation.

The type II pattern exhibited MR and clinical features totally different from those found in the type I category. These glands were asymptomatic, demonstrated fat infiltration of the gland, and the gland size was smaller in 75% of these patients. We counselled these patients to consider surgical removal of the sialoliths and atrophic glands because of the risk of secondary infection owing to impaired salivary flows. Thus, we excised the affected gland from one of these type II patients after obtaining informed consent. Histopathologic studies confirmed the fat in the excised gland obtained from this patient. In the other three type II patients, only ductal stones were removed.

Type III patients had no apparent abnormalities on MR images, no symptom or history of pain or swelling, and relatively small sialoliths suggestive of incomplete obstruction of the gland. To prevent symptoms caused by secondary infection, we removed these stones.

In our study, CT was also able to depict some active inflammatory changes in the glands affected by sialolithiasis. In six of the nine patients with glands classified as type I, CT showed that, compared with the healthy glands on the opposite sides, the affected glands had increased density or enhanced after contrast medium injections, suggesting active inflammation or increased vascularity of the affected gland (1). Taken together, findings from MR imaging were well correlated with those from CT imaging.

In our study we saw that the benefits of MR imaging are twofold. First, MR imaging can depict the status of the gland parenchyma affected by sialolithiasis. Sialography and CT are useful in obtaining the information about a sialolith, but the information about the gland itself is limited compared with MR imaging. For example, sialography cannot demonstrate the gland change when a sialolith completely obstructs the duct. CT cannot demonstrate sublingual gland sialoadenitis caused by stones located near the orifice, and fat infiltration in the gland is more visible with MR imaging than with CT (7). Second, MR does not require the cannulation of the duct, which cannot be achieved every time. Furthermore, retrograde injection of contrast material may exacerbate the inflammation of the gland. In addition, MR sialography could replace the conventional sialography in depicting the dilated duct and also the sialolith in it. MR sialography was postulated as an alternative for the conventional sialography in diagnosing Sjögren's syndrome (8). Taken together, an overall view may be that although in a proper clinical setting of a suspected calculus, CT should be performed in order to identify the calculus. Parenchymal changes of the submandibular and sublingual glands are more visible with MR imaging than with CT.

In conclusion, MR imaging features of the submandibular glands affected by sialolithiasis were well correlated with the clinical features of the patients and with CT features of the gland. In this context, MR imaging, using T1-weighted and fat-suppressed T2-weighted and STIR sequences, can provide effective information about the pathologic status of the gland parenchyma affected by sialolithiasis. Furthermore, the extent and chronic nature of this obstruction may reflect the MR imaging findings of the gland parenchyma. A combination of MR and CT studies may complement each other, and may offer a promising diagnostic strategy for treatment and follow-up studies in sialolithiasis.

**TABLES AND CHARTS:**

**Table 1: Clinical features of 12 patients with Sialolithiasis of submandibular gland.**

| Patient | Age/Sex | Symptoms | | |
|---|---|---|---|---|
| | | Pain | Swelling | Pus discharge |
| Type 1 | | | | |
| 1 | 66/F | ABSENT | PRESENT | PRESENT |
| 2 | 65/F | PRESENT | PRESENT | PRESENT |
| 3 | 32/F | PRESENT | PRESENT | ABSENT |
| 4 | 32/M | PRESENT | PRESENT | ABSENT |
| 5 | 18/M | PRESENT | ABSENT | ABSENT |
| 6 | 23/F | PRESENT | ABSENT | ABSENT |
| 7 | 64/M | PRESENT | PRESENT | PRESENT |
| Type 2 | | | | |
| 8 | 68/F | ABSENT | ABSENT | ABSENT |
| 9 | 62/M | ABSENT | ABSENT | ABSENT |
| 10 | 52/F | ABSENT | ABSENT | ABSENT |
| Type 3 | | | | |
| 11 | 56/F | ABSENT | ABSENT | ABSENT |
| 12 | 18/F | ABSENT | ABSENT | ABSENT |

**Table 2: CT scan features of 12 patients with sialolithiasis of submandibular gland.**

| Patient | CT Imaging features SIALOLITH (mm) | | | Density of the gland |
|---|---|---|---|---|
| | DISTAL | MIDDLE | PROXIMAL | |
| Type 1 | | | | |
| 1 | 2 | | 4 | INCREASED |
| 2 | | | 8 | INCREASED |
| 3 | | 7 | | INCREASED |
| 4 | 2 | | 10 | INCREASED |
| 5 | 3 | | 5 | INCREASED |
| 6 | | | 9 | NO DIFFERENCE |
| 7 | | | 5 | DECREASED |
| Type 2 | | | | |
| 8 | | | 6 | NO DIFFERENCE |
| 9 | | | 9 | DECREASED |
| 10 | | | 12 | DECREASED |
| Type 3 | | | | |
| 11 | | 4 | | NO DIFFERENCE |
| 12 | | | 4 | NO DIFFERENCE |

**Table 3: MRI features of 12 patients with sialolithiasis of submandibular gland.**

| Patients | MR imaging features | | | |
|---|---|---|---|---|
| | T1 | FS-T2/STIR | SIZE | Sublingual gland involvement |
| TYPE 1 | | | | |
| 1 | DECREASED | INCREASED | INCREASED | PRESENT |
| 2 | DECREASED | INCREASED | NO DIFFERENCE | ABSENT |
| 3 | DECREASED | INCREASED | INCREASED | ABSENT |
| 4 | NO DIFFERENCE | INCREASED | INCREASED | ABSENT |
| 5 | DECREASED | INCREASED | NO DIFFERENCE | PRESENT |
| 6 | INCREASED | NO DIFFERENCE | DECREASED | PRESENT |
| 7 | DECREASED | INCREASED | NO DIFFERENCE | ABSENT |

| | | | | |
|---|---|---|---|---|
| TYPE 2 | | | | |
| 8 | INCREASED | NO DIFFERENCE | NO DIFFERENCE | ABSENT |
| 9 | INCREASED | DECREASED | DECREASED | ABSENT |
| 10 | INCREASED | NO DIFFERENCE | DECREASED | ABSENT |
| TYPE 3 | | | | |
| 11 | NO DIFFERENCE | NO DIFFERENCE | NO DIFFERENCE | ABSENT |
| 12 | NO DIFFERENCE | NO DIFFERENCE | NO DIFFERENCE | ABSENT |

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