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Importance of magnetic resonance imaging for evaluation of a child with prominent swelling of the facial region after trauma: report of a case

CASE REPORT

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Abstract – In the present case of a 9-year-old girl with prominent swelling in the mental and facial regions after trauma, repeated magnetic resonance (MR) examinations were performed to evaluate areas of incision, because the swelling became worse and more prominent despite intravenous antibiotic treatment. However, there was no evidence of respiratory tract impingement or deformation, including obliteration, on MR imaging. Therefore, surgical treatment involving an incision because of facial region swelling was cancelled, and the intravenous antibiotic therapy was continued. To prevent misdiagnosis and over-treatment of young children with inflammation of the oral and maxillofacial regions, dentists, including pediatric dentists, should be aware of the clinical usefulness of MR examinations. In particular, MR examinations are non-invasive for young children, because there is no X-ray exposure, and they can be used repetitively. At the same time, the present case demonstrated that it is very difficult to understand and predict changes in the inflammation process associated with children's facial trauma.

Inflammation after trauma in young children tends to deteriorate over a very short time and may be lethal (1). Because the oral and maxillofacial regions are adjacent to the respiratory tract, the respiratory tract can be deformed and obliterated by expansive swelling in these areas over a very short time (2–4). Furthermore, the oral and maxillofacial regions are complex in anatomy, with rich fatty tissues, tangled vessels, and soft tissues. Therefore, the imaging evaluation of the extent and state of inflammatory changes, including swelling after trauma, is very difficult with simple X-ray images, such as dental and panoramic X-ray images, but three-dimensional (3D) images, including computed tomography (CT) and magnetic resonance imaging (MRI), are very useful for evaluation. Particularly in young children, magnetic resonance (MR) examinations are non-invasive because there is no ionizing radiation. However, most general dentists, including pediatric dentists, are not aware of this. The difficulty of predicting inflammatory change after trauma in the oral and maxillofacial regions and the significance of repeated MRI examinations for evaluation of inflammation are illustrated by the present case.

Case report

In late 2009, a 9-year-old girl with a chief complaint of prominent swelling and pain in the mental region was brought to our dental hospital. The girl and her mother reported that the prominent swelling and pain in the mental region began immediately after she hit a ladder and fell from monkey bars. Her past and family illness was unremarkable. She had a symmetric, prominent swelling, and spontaneous pain in the mental and lower part of the face (Fig. 1). The girl had a temperature of 37.0°C at initial presentation, with normal breathing.

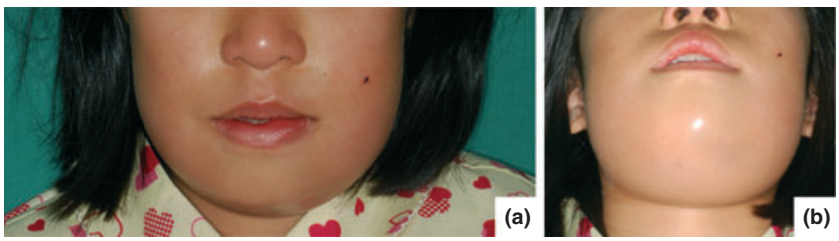

Fig. 1. Photograph of the facial appearance of a 9-year-old girl shows symmetric, prominent swelling in the mental region and lower face at the initial examination.

Oral findings showed that her lower lip was lacerated and bleeding in the middle. However, the bleeding from her lower lip was stopped by pressure with gauze for 5 min. Her central and lateral lower incisors were slightly bilaterally moving. CT images showed a small amount of swelling and an unclear margin of soft tissue, as well as cloudy fat tissue around the mental region, but no findings of a fractured mandible (Fig. 2). Blood test results were as follows: hematocrit 39.9%, hemoglobin 13.5 g dl^{-1}, white blood cell count 8350 per mm^3 (high), and C-reactive protein (CRP) 2.62 (high).

This case was clinically diagnosed as acute inflammation in the mental and lower face regions after trauma. The patient was immediately admitted and treated with intravenous cephem antibiotics. Then, oral cephem antibiotics were given for 5 days.

The day after admission, swelling and spontaneous pain in the mental region and lower face became worse, but her temperature and breathing remained stable. Blood test results on the next day were as follows: white blood cell count 5940 mm^{-3} (normal) and CRP 2.27 (high). Clinically, she was considered to have worse inflammation in the mental region and lower face, and MRI was performed to evaluate the extent of inflammation and the presence of abscess formation in the mental region. MRI revealed swelling and an unclear margin of soft tissue, as well as cloudy fat tissue around the mental region and lower face, but no abscess formation (Fig. 3). We decided to continue intravenous and oral cephem antibiotics and anti-inflammatory medications as an inpatient. However, during the night to the next day, the swelling in the mental region and lower face became more prominent, and the spontaneous pain continued.

On the third hospital day, therefore, we planned to operate to reduce the prominent swelling if it were to affect the respiratory tract. The patient continued to have a temperature of 37.0°C and normal breathing. The second MRI showed expansion of the extent of inflammation and abscess formation, but no evidence of respiratory tract impingement or deformation (Fig. 4). Based on the MR findings, we decided to cancel surgery and continue intravenous and oral cephem antibiotics and anti-inflammatory medications in hospital.

On the fourth hospital day, the swelling and the spontaneous pain in the mental region and lower face suddenly disappeared (Fig. 5). Of course, tenderness also decreased. Oral examination showed that slight movement of the bilateral lower incisors and lateral incisors was continuing, and the cervical gingiva around the lower front teeth had become black in color.

On the fifth hospital day, the swelling and spontaneous pain in the mental region and lower face had completely disappeared, and the patient was discharged.

One month after discharge, she re-visited our dental hospital to evaluate the recovery around the lower front teeth. We should have evaluated the lower front teeth initially, but the patient's status was poor at that time, and her teeth fractures could not be detected on observation. Thus, we checked for teeth fractures after her condition improved. Dental X-rays of the lower front teeth showed that the bilateral lower incisors and lateral incisors did not have crown and root fractures, and there

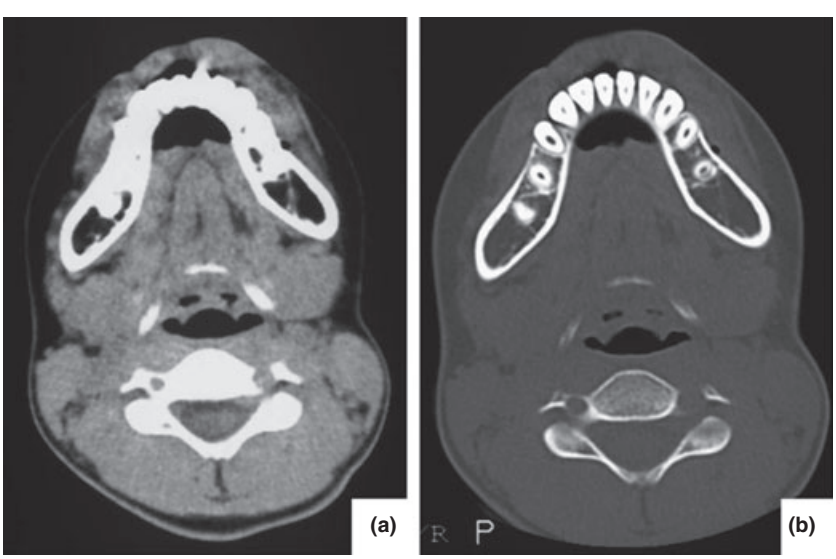

Fig. 2. Computed tomography (CT) imaging findings of the mental region and lower face at the initial examination. Axial CT images (a. soft tissue target images; b bone target images) reveal slight swelling and an unclear margin of the soft tissues, as well as cloudy fat tissue around the mental region, but no mandibular fracture.

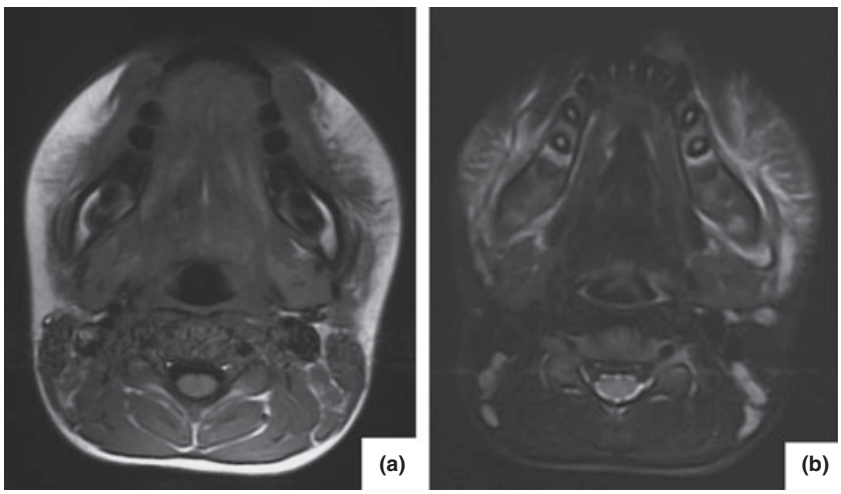

Fig. 3. Magnetic resonance (MR) imaging findings of the mental region and lower face 2 days after trauma. MRI (a. T1-weighted images; b. short TI inversion recovery images) shows swelling and an unclear soft tissue margin, as well as cloudy fat tissue around the mental region and the lower face, but no abscess formation.

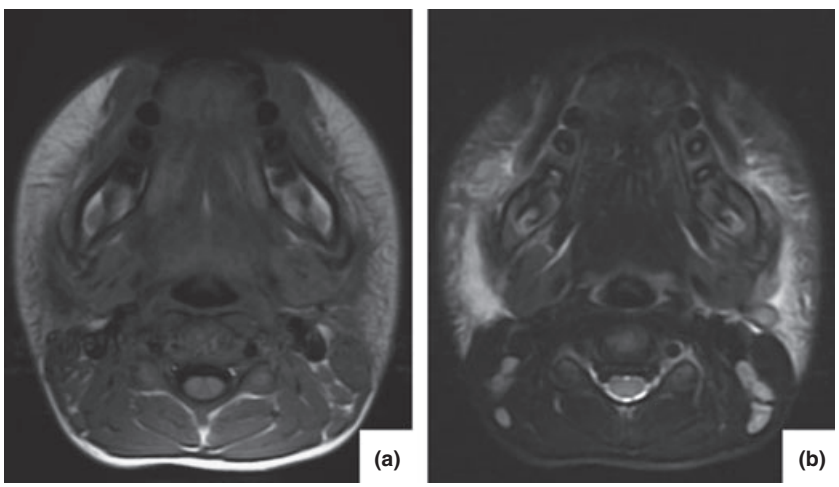

Fig. 4. Magnetic resonance (MR) imaging findings of the mental region and lower face 3 days after trauma. MRI (a. T1-weighted images; b. short TI inversion recovery images) shows expansion of the extent of inflammation and abscess formation, but no respiratory tract impingement or deformation.

Fig. 5. Photograph of the facial appearance of a 9-year-old girl shows a sudden decrease in the symmetric swelling of the mental region and lower face 4 days after trauma.

was no expansion of the periodontal ligament space (Fig. 6). However, the lower central and lateral incisors were still mobile, but the lower lip was healed in the center part with normal sensation.

Discussion

Empirically in children after trauma to the oral and maxillofacial regions, inflammation sometimes deteriorates over a very short time and may be lethal in some cases because of respiratory tract obliteration by sudden, expansive inflammation. On the other hand, children's conditions can also improve over a short time. Therefore, it is important to monitor the patient's condition very carefully. At the same time, appropriate treatment should be selected. This case presentation indicated the great usefulness of MRI for repeatedly evaluating the changes in inflammation after trauma in the oral and maxillofacial regions. In particular, MRI is a non-invasive technique for children, and its repeated use can be very useful in children. In the present case, inappropriate surgical procedures to reduce the prominent swelling could be avoided based on the repeated MR findings.

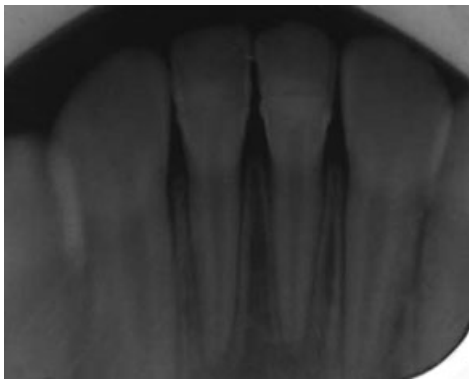

Fig. 6. Dental X-ray film of the lower front teeth shows that the bilateral lower incisors and lateral incisors have no crown and root fractures and no expansion of the periodontal ligament space 1 month after trauma.

MRI is a non-invasive investigation and can be used repeatedly (5, 6). However, there are some problems on MR examination in children (5–11). One of the problems is that MR examination cannot be performed because young children cannot remain still for the acquisition time (about 3 min) (7–11). It has been suggested that the age at which MR examinations can be performed without medications may be from 7 or 8 years (8–11). In addition, previous studies have shown that young children can get used to MRI examinations by repeated MR examinations (8–11). In the present case, a 9-year-old girl could adapt to the MR examinations in the present case, and the MR images were very good for evaluating relative alterations in the soft tissues associated with inflammation after trauma. A CT examination was also performed in the present case to evaluate the presence of mandibular fractures and expansion of inflammation on the first day after trauma. However, it was difficult to evaluate the precise extent of inflammation on CT scan. MR images are more appropriate than CT images for evaluation of the exact extent of inflammation, but not for the presence of fractures. In addition, CT examinations are invasive because of radiation exposure; the average effective dose for this type of examinations can be about 2 mSv per examination (12, 13). This amount of radiation exposure may not have adverse effects, but repeated examinations should be avoided.

However, most dentists, including pediatric dentists, are unaware of the clinical usefulness and disadvantages of MR and/or CT, and they do not use these modalities appropriately. Thus, in addition, education and training of dentists in the appropriate clinical use of MRI and CT are needed.

In the present case, the swelling and spontaneous pain in the whole lower face increased prominently despite the lack of mandibular fractures after trauma to the mental region. In addition, the prominent swelling was increasing despite administration of anti-inflammatory and antibiotic medications for 3 days after trauma. On the other hand, symptoms improved dramatically after 3 days after trauma with no change in treatment.

The present case reminds us that it is very difficult to understand and predict the sequential changes in inflammation associated with children's trauma (1–4). In the present case, it was fortunate that there was no inflammatory expansion involving the respiratory tract. In cases of respiratory tract involvement, surgical procedures are necessary (14). To determine the need for surgery, several factors should be considered, including respiratory rate, breath sounds, and the patient's general condition (15). At the same time, the partial pressure of O_2 should be evaluated (15). Dentists should understand these issues in patients with inflammatory changes after trauma involving the oral and maxillofacial regions, in children as well as in adults, and be familiar with the appropriate clinical use of MRI and CT.

Conflict of interest

This study was supported in part by grants from the grant-in-aid for Scientific Research from the Ministry of Education, Science, Sports, and Culture of Japan, a grant-in-aid for scientific research from the President of Kyushu Dental College, and from Kitakyushu City, to YM.

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