

Analysis of the Value of X-ray and CT in the Health Examination of Children with Sinusitis

Qingru Hu¹, Binsheng Huang², Hongyun Qi³

¹Radiology Department, Donghu Hospital, China

²General Manager, Zhaoqing Meilante Technology Co., Ltd, China

³General Practice, Henan Fengqiu People Hospital, China

Abstract: *Objective: this research explores the value analysis of X-ray examination and CT examination in the health examination of children with sinusitis. Methods: this research selected 124 cases of paranasal sinusitis diagnosed and treated in our hospital from March 2017 to July 2019 to undergo X-ray examination and CT coronal scan, and compare the conditions of the patients after the two examination methods. Analysis. In this research, the children who participated in the study were divided into two groups according to the random allocation method. The CT group of pediatric sinusitis patients underwent CT examination, and the X-ray group pediatric sinusitis patients underwent X-ray examination. The CT examination group and X-ray examination were compared and analyzed. The clinical examination effect of the group, so as to compare and analyze the application value of the two examination methods. Results: The positive detection rate of CT group was much higher than that of X-ray examination group. Spiral CT can reconstruct images from different angles at the maximum density, and can be as clear as possible of the lesion location and signs, so as to prepare for the next surgical treatment. X-ray examination cannot clearly and accurately show the degree of mucosal thickening, nor can it diagnose ethmoid sinus and other diseases. The differences in the data inspection results between the two groups were statistically significant ($P < 0.05$). Conclusion: In clinical health examinations for children suspected of pediatric sinusitis, CT scans should be used to diagnose the disease in a timely and accurate manner. X-ray examination and diagnosis should be used with caution based on the corresponding symptoms and disease conditions. It thus effectively reduces the clinical misdiagnosis rate and ensures a good treatment effect.*

Keywords: X-ray, CT examination, pediatric sinusitis

1. Introduction

Sinusitis in children is more common and is getting more and more attention. Its etiology, symptoms, diagnosis and treatment are different from those of adults. The incidence of sinusitis in children is related to the degree of development. The maxillary and ethmoidal sinuses develop relatively early. They are usually infected first, and the frontal and sphenoid sinuses begin to develop after 2-3 years of age. It is difficult to diagnose sinusitis in children, and CT is of great value in the diagnosis of sinusitis in adults. The diagnosis of sinusitis in children mainly relies on history analysis and detailed clinical examination. [3] The symptoms of sinusitis in children are different from those in adults. Cough, rhinorrhea, and chronic otitis media are common in children. In adults, chronic headaches, nasal congestion, and abnormal drainage are common. At present, the most commonly used topical Chinese medicine lipid-lowering rhinitis ointment, twice a day, is safe and thorough. Sinusitis in children is a common disease in children. Its etiology, symptoms, diagnosis and treatment are different from those of adults. According to clinical symptoms, children's sinusitis can be roughly divided into three types: (1) acute sinusitis; (2) recurrent acute sinusitis; (3) chronic sinusitis. Sinusitis in children, if the cold lasts for a week, the pus is not reduced or even increased, and the symptoms are worse, sinusitis should be considered. It can be further diagnosed by X-ray inspection, CT inspection, and ultrasound inspection. Therefore, this research has a more clinical diagnostic value that can effectively diagnose the disease and ensure more timely and effective treatment of the disease, so as not to delay the disease. This article takes 124 children with sinusitis in our hospital in recent years as the research object. [4] After comparing and observing the X-ray and CT examinations, the clinical application value analysis and comparison of different examination methods for the diagnosis of patients' diseases are as follows.

2. Materials and methods

2.1 General information

From March 2017 to July 2019, 124 patients with paranasal sinusitis who underwent X-ray kava radiography and CT coronal scan were selected for comparative examination and analysis. The age range of the study subjects was 1 month to 13 years old, with an average age of (6.52 ± 3.27) years old. There were 78 males and 46 females, 54 cases had no headache, 33 cases had poor sense of smell, 30 cases had facial and neck tenderness, and had inattention. 32 cases. According to the principle of random allocation, the children with sinusitis who will participate in the study are first randomly allocated into two groups, and they are given different inspection schemes to compare and study the final clinical effect data of the two groups. Control group: 62 cases of pediatric sinusitis requiring examination were diagnosed and treated in our hospital from March 2017 to July 2019. Among them, 39 cases were boys and 23 cases were girls. The age ranged from 1 month to 13 years, with an average of (7.42 ± 2.74) years old; experimental group: 62 cases of pediatric sinusitis requiring examination were diagnosed and treated in our hospital from March 2017 to July 2019, including boys: 39 cases, girls: 23 cases, age 2 months -12.5 years old, with an average age of (6.24 ± 3.17) years old. X-ray and CT examinations were performed on children with sinusitis in the control group and the test group participating in the study, and the relevant data were recorded and compared with the relevant clinical effect analysis. [5] For the 124 cases of pediatric sinusitis patients who participated in the research, the parents have been informed in detail about the purpose and procedures of the research, so the parents' consent was obtained for the trial. [2] There was no significant difference in the relevant data of all patients participating in the study, and the difference was not statistically significant ($P > 0.05$).

2.2 Method

Diagnosis of sinusitis in children: If the cold lasts for a week, the purulent discharge does not decrease or even increase, and the symptoms will worsen, sinusitis should be considered. X-ray examination or CT examination and ultrasound examination are usually used for further diagnosis. [1] In this research, from March 2017 to July 2019, 124 patients with paranasal sinusitis underwent X-ray examination and CT coronal scan in our hospital were selected for comparative analysis. The children who participated in the study were divided into two groups according to random allocation. [6] Group, CT group performed CT examination, X-ray group performed X-ray examination, and the clinical application value of CT examination and X-ray examination was compared and analyzed. The details are as follows.

2.2.1 Use related equipment

X-ray and CT examinations were performed on 124 pediatric patients, namely, sinus kava radiograph X-ray, GE Proseed AI single-slice spiral CT machine coronal or horizontal scan were used as the two inspection methods. Coronal scan: the scan line is perpendicular to the hard palate, from the frontal sinus wall to the posterior wall of the sphenoid sinus, with a thickness of 5mm; horizontal scan: the baseline is parallel to the orbital ear line, and the scan range is from the upper edge of the frontal sinus to the maxillary alveolar process. The scanning conditions are 120 kV voltage, 100 mA current, 15 seconds scanning speed, 11 pitch, 512x512 matrix. Window technology: soft tissue window width 20Hu, window level 40Hu, bone window width 1500Hu, window level 40Hu.

2.2.2 Disease diagnosis process

(1) Detailed medical history: If the child has a cold for more than a week, the symptoms such as nasal congestion and runny nose will not be relieved but aggravated, and the nasal congestion and runny nose will increase. [7] The possibility of sinusitis should be considered.

(2) Systemic symptoms are more obvious than adults: For example, acute sinusitis may have symptoms of high fever and poisoning, or even dehydration, convulsions, sometimes nausea, vomiting, coughing, etc.; Chronic sinusitis may have low-grade fever, low spirits, poor appetite, and weight relief, poor memory and other symptoms. [8]

(3) Nasal cavity and local examination: In acute sinusitis, the soft tissues around the sinuses are more swollen, tender, and runny than adults. Nasal examination is very important. It can be used to check the nostrils before nasoscopy in children. [9] The nasal mucosa of acute sinusitis is characterized by acute congestion and swelling. There is a large amount of purulent mucus in the nasal cavity, and the phenomenon of nasal mucus flowing into the pharynx is more common than in adults. It is necessary to cooperate with the pharyngeal examination to observe whether there is purulent mucus flowing out of

the posterior nostril on the back wall of the throat. [10]

(4) X-ray and CT scan: The diagnosis of sinusitis in children should be combined with clinical symptoms, signs and medical history for reference. Older children may see cloudy sinuses, fluid levels, thickening of the mucous membrane more than 4 mm, or polyps or mucous cysts.

(5) Synthesize various diagnostic data and analyze the results.

2.3 Observation indicators

2.3.1 Causes

To confirm the diagnosis of suspected pediatric sinusitis, it is necessary to understand the causes and manifestations of pediatric sinusitis. Details are as follows:

(1) Children's sinus orifice is relatively large, and cold is easy to invade the sinus through the sinus orifice.

(2) Easy to catch colds, upper respiratory tract infections and acute infectious diseases (such as measles, whooping cough, scarlet fever, flu, etc.).

(3) Enlarged tonsils or adenoids affect normal breathing.

(4) Congenital immune insufficiency or allergies.

(5) Swimming or diving in unclean water.

(6) Nasal trauma can easily cause foreign bodies in the nasal cavity and secondary infections.

(7) Immature accessory sinus function: the younger the child, the greater the possibility of sinusitis; generally speaking, children over 7 years of age are less likely to suffer from sinusitis due to the mature immune function and accessory sinus function .

(8) Allergic rhinitis, allergic rhinitis in children is mostly caused by heredity, so many people suffer from allergic rhinitis since childhood. According to statistics, both parents have a history of allergic rhinitis, and more than 80% of children have allergic rhinitis. [11] The father or mother has allergic rhinitis, 50% of children may inherit it, and 50% of children with allergic rhinitis will be complicated by sinusitis.

2.3.2 Clinical manifestations

Acute sinusitis: The early symptoms are similar to acute rhinitis or cold, but the systemic symptoms are more pronounced than in adults. Therefore, in addition to nasal congestion and excessive pus, there may be symptoms such as fever, dehydration, lethargy or restlessness, shortness of breath, refusal to eat, and even convulsions. Accompanied by sore throat and cough; it may also be accompanied by acute otitis media, nose bleeding, etc.; older children may complain of headache or pain on one side of the cheek.

Chronic sinusitis: It mainly manifests intermittent or frequent nasal congestion, mucus or mucus-purulent nasal discharge, often on the verge of epistaxis, severely ill people may show lack of energy, poor appetite, weight loss or low-grade fever, or even secondary systemic diseases such as anemia, rheumatism, joint pain, colds, gastrointestinal or kidney disease, cause dysplasia. [12]

Due to long-term nasal obstruction and mouth-opening breathing, the children's maxillofacial, chest, and mental development are poor. There are seven major symptoms of sinusitis in young children: (1) persistent purulent rhinorrhea; (2) chronic nasal obstruction; (3) posterior nostril leakage; (4) cough: usually heavier when sleeping and waking up; (5) breathing Stinky; (6) headache; (7) behavior change. Children's physical signs can usually be expressed as: nasal mucosal congestion, purulent drainage in the nasal cavity or posterior nostril leakage, nasal polyps and or face and periorbital swelling, and can also be accompanied by signs of exudative otitis media and adenoid hypertrophy. [13]

The diagnosis of sinusitis in children should be based on symptoms, signs, and imaging examinations, and a comprehensive analysis should be used to make the final diagnosis. [14]

2.3.3 X-ray inspection

X-ray examination is widely used in the diagnosis of diseases, and is one of the most effective methods for early detection, early diagnosis and differential diagnosis of certain diseases. With the accumulation of X-ray examination and diagnosis experience, the continuous improvement of equipment and the application of new technologies, X-ray examination has become an indispensable tool in disease

diagnosis. X-ray inspection involves various parts of the human body, and angiography of the lumen tube head is performed through conventional fluoroscopy, X-ray photography and various methods. It can not only locate and characterize, but also understand the size, number and scope of lesions. As long as the reasonable application of various X-ray examinations, combined with clinical history, physical signs and other examinations, the purpose of diagnosis can usually be achieved. [15]

2.3.4 CT examination

CT is a fully functional disease detection instrument. It is an abbreviation for X-ray computed tomography. CT examination is carried out based on the difference in absorption and transmission of X-rays in different tissues of the human body. It uses a highly sensitive instrument to measure the human body, and then inputs the measured data into an electronic computer. After the electronic computer processes the data, it can collect cross-sections or three-dimensional images of the examined parts of the human body, and find small lesions in any part of the human body. Note that patients who cannot undergo CT examination include: iodine contrast agent allergy; severe liver and kidney damage; severe thyroid disease (hyperthyroidism); renal insufficiency; heart disease: such as congestive heart failure, coronary heart disease, arrhythmia, etc.; Patients who are allergic to contrast agents and other drugs; children under 1 year old and elderly over 60 years old are prohibited from using this inspection method.

2.4 Statistical analysis

In this research, test-related data was entered into the establishment of a database, and the data was logically checked. $\bar{x} \pm s$ means measurement data, frequency n means count data, sample t test, when $P < 0.05$, it is statistically significant.

3. Results

3.1 The examination results of the two groups of children with sinusitis

The positive rate of CT group was 80.64%, and the positive rate of X-ray group was 62.90%. Comparing the data of the two groups, it can be seen that the positive rate of the CT group is higher than that of the X group, and the CT examination effect is better. The comparison was statistically significant ($P < 0.05$). The detailed data is shown in Table 1.

Table 1: Comparison of examination results of the two groups of patients

Group	n	Masculine	Feminine	Masculine Rate
Control group	62	50	12	80.64%
Test group	62	39	23	62.90%

3.2 Imaging performance

There were varying degrees of fluid accumulation in the sinuses in the CT group. The inflammation caused the mucosa to thicken, which was manifested by the increased density of the soft tissue covered by the bone in the sinuses. The CT value of acute exudative sinusitis is about 20 hu higher than horizontal. Spiral CT shows that the original clear honeycomb cribriform is thickened and the edges are blurred. The thickened soft tissue density shadows the bones and causes the nasal cavity to narrow. In the X-ray group, nasal sinus cavity effusion and mucosal thickening were obvious, but the mucosal thickening, low density, unclear resolution, and ethmoid sinus lesions could not be correctly diagnosed.

4. Discussion

The maxillary sinus-ethmoid sinus has already appeared at birth and developed rapidly, and may develop into maxillary sinusitis and ethmoid sinusitis during infancy. The frontal sinus and sphenoid sinus appeared at 2 and 4 years old, respectively. Children's nasal mucosa is soft, easy to swell due to hematoma, and easy to suffer from rhinitis; at the same time, the nasal cavity is small, often with adenoid hypertrophy, and easy to suffer from sinusitis. The sinuses and sinuses become inflamed and infect each other. At the same time, the sinuses are adjacent to each other, and the sinuses are affected by inflammation. The sinuses are closely related to the surrounding tissues (including the orbital bone, neurovascular, skull, craniopharyngeal tube, etc.). Sinus inflammation often involves the surrounding

area, causing serious complications such as orbital infection, optic neuritis, otitis media, meningitis, and brain abscess, which seriously threaten the health of infants and young children.

According to related studies, some patients found pus in the sinuses during puncture and irrigation; in addition, the autopsy of different causes of death had sinusitis, which showed that the incidence of sinusitis was high. Sinusitis and lower respiratory tract infection affect each other, and also affect the treatment of lower respiratory tract inflammation. Related reports indicate that 38% of children with lung disease have sinusitis. Therefore, timely and accurate diagnosis of sinusitis in children is very important. CT coronal scan images are accurate and clear, and the positive rate is significantly higher than that of X-ray kava film. The contrast between X-ray film and X-ray film solves the problem of poor contrast between the thin layer of the baby's skull and the soft tissue. It has good resolution to tooth germ and other tissues, and it is not easy to cause misdiagnosis. For some children with simple sphenoid sinus effusion, CT examination is better than other examinations. They usually only have headache symptoms, but ordinary X-rays can hardly show the condition of the sphenoid sinus. Only with the help of a CT coronal scan can an accurate diagnosis.

Spiral CT can reconstruct images from different angles with the maximum density, so that the lesion location and signs are as clear as possible, so as to prepare for the next operation. X-ray examination cannot clearly and accurately show the degree of mucosal thickening, nor can it diagnose ethmoid sinus and other diseases. X-ray is of little significance in the diagnosis of sinusitis in children under 5 years of age. Relatively speaking, CT is necessary. According to clinical symptoms, signs and medical history, older children have sinus effusion and mucosal thickening of more than 4m. Some children have symptoms such as polyps and mucous cysts. This research selected 124 patients with paranasal sinusitis in our hospital who underwent X-ray examination and CT coronal scan from March 2017 to July 2019 for comparative analysis. The results showed that the positive rate of spiral CT was 80.64%, which was a significant difference. X-ray examinations higher than 62.9% were statistically significant ($P < 0.05$). In short, spiral CT has a good effect on the diagnosis of sinusitis in children. It helps the choice of treatment methods and the early recovery of patients. It is worthy of clinical widespread promotion.

5. Conclusion

In summary, CT examination for suspected pediatric sinusitis patients has more clinical value than X-ray examination. Therefore, CT scans should be used in the health examination of children who are clinically suspected of having pediatric sinusitis in order to diagnose the disease in a timely and accurate manner. X-ray examination and diagnosis should be used with caution based on the corresponding symptoms and disease conditions to reduce clinical misdiagnosis Rate to ensure a good treatment effect.

References

- [1] Chen Zuhong, Lu Zhihua. *The application value analysis of spiral CT in the diagnosis of sinusitis in children [J]. Modern Diagnosis and Treatment, 2014, 2504: 818.*
- [2] Cai Lan, Qin Gang. *Comprehensive treatment of children with sinusitis [J]. Chinese Journal of Medical Science, 2011, 122: 47-48.*
- [3] Shi Shengli, Chen Wan. *Application value of spiral CT in children with sinusitis [J]. Chinese Medical Frontiers, 2010, 515: 62.*
- [4] Chen Weiliang. *Spiral CT application value in children with sinusitis [J]. Chinese Journal of Practical Medicine, 2010, 536: 145.*
- [5] Chen Wan, Chen Zhiping, Chen Weiliang. *Comparison of CT and X-ray examination of children with sinusitis [J]. Journal of Henan Medical College for Staff and Workers, 2005, 04: 30-31.*
- [6] Liu Yi, Han Rufeng, Shi Lei. *Clinical CT changes in children with sinusitis (analysis of 100 cases) [J]. Chinese Community Physician (Comprehensive Edition), 2005, 20:48.*
- [7] Li Na, Chen Wan, Li Xihong. *The clinical significance of CT coronary scan in diagnosis of sinusitis in children [J]. Journal of North China Coal Medical College, 2000, 04: 440-441.*
- [8] Cheng Yongshan, Li Baoguo, Yang Ju. *Clinical experience of 180 children with sinusitis [J]. Gongqi Medical Journal, 2000, 06: 46.*
- [9] Wang Jinquan. *X-ray diagnosis of 156 cases of infantile sinusitis [J]. Journal of Jining Medical College, 1993, 04: 59.*
- [10] Li Jingwei, Zhang Peng, Tian Xudong, Zhang Xingkai. *Clinical study of X-ray plain film, CT and MRI images of fungal sinusitis [J]. Journal of Clinical Rational Drug Use, 2020, 13 (02): 160-161*
- [11] Zhang Limin, Wang Lingyun. *Discussion on the diagnostic value of X-ray and CT in children with*

sinusitis [J]. Chinese Journal of Practical Medicine, 2014, 9 (11): 74-75.

[12] *Chen Wan, Chen Zhiping, Chen Weiliang. Comparison of CT and X-ray examination of children with sinusitis [J]. Journal of Henan Workers Medical College, 2005 (04): 30-31*

[13] *Zhang Tiesong, Shi Hao, Lin Jianyun. Clinical significance of CT scan of sinuses on inflammatory diseases of sinuses in children [J]. Yunnan Medicine, 2005 (01): 41-42.*

[14] *Fu Xiaodong. Combining X-ray signs to distinguish 76 cases of sinusitis [J]. Jiangsu Chinese Medicine, 2001 (10): 37.*

[15] *Yu Jinxing. X-ray and ultrasound examination of paranasal sinusitis [J]. Foreign Medicine (Clinical Radiology Volume), 1988 (02): 102.*