Clinical Evaluation of Congenital Muscular Torticollis by using MR Imaging

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先天性筋性斜頸におけるMR imagingの臨床的評価

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先天性筋性斜頸は胸鎖乳突筋内の腫瘤が線維化して固定化する．腫瘤は大部分生後1年以内に自然消退すると言われている．斜頸位のままで線維化した場合は外科的治療を必要とする．したがって早期に保存的療法を行い頸部回旋制限を取り除くことが行われる．現在超音波検査が胸鎖乳突筋の病変の評価や保存的療法の効果の判定に用いられている．

MRIは骨，軟部組織の描出に優れており，治療法の選択や経過の把握に有用と考え，15例の先天性筋性斜頸について検討した．年齢は生後1カ月10日の乳児から24歳5カ月までで，6人は1歳以下であった．MRIは1.5Tの超伝導装置で行った．15例についてT1強調，T2強調およびプロトン密度強調像を比較したが，斜頸の腫瘤の描出にはプロトン密度強調像が優れていた．

初診時および保存療法中に4-5回検査した例で見ると，病巣はプロトン密度強調像で高信号強度から次第に低信号強度に変化していった．そこで初診時のMR画像を均等高信号型(Type 1)，網状高信号型(Type 2)，網状低信号型(Type 3)，均等低信号型(Type 4)の4型に分類すると，年少児はType 1，2の高信号型で，年長児になるに従い低信号型が多く見られた．6例にGd-DTPAによる造影を行ったが，明瞭な増強効果は認められなかった．増強効果がなかったのは線維化した状態と考えられた．

一般に浮腫または浮腫様の部位はT2強調およびプロトン密度強調像では高信号を呈する．斜頸位で低信号を呈するものは線維化しているためで，外科的治療が必要と考えられた．保存的療法では経過中に低信号に変化した時点で斜頸位が残存していれば外科的療法が必要になると考えた．先天性筋性斜頸ではMRIのプロトン密度強調像が治療法の選択および経過観察に有用と考えられる．

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INTRODUCTION

Congenital muscular torticollis is caused by swelling of unknown origin within the sternocleidomastoid muscle. A mass is palpable at birth or in early infancy. The reported incidence of congenital muscular torticollis is 0.4% in new born babys[1]. It is believed that it usually diminishes within a year. Conservative treatment is recommended in early infancy. If the treatment fails and torticollis remains, surgery is needed, because permanent torticollis becomes worse during growth and causes asymmetry of the face and skull.

It is difficult to judge clinically whether the patient needs surgery or conservative treatment and whether the patient needs to continue conservative treatment.

MR imaging is a preferred method to investigate musculoskeletal lesions and provides information of fibrosis. There is no systematic evaluation of congenital muscular torticollis by MR imaging. The purpose of this paper is to demonstrate MR imaging patterns of swelling of sternocleidomastoid muscle and the stages of congenital muscular torticollis for its judgement and in selection of treatments.

MATERIALS AND METHODS

Fifteen patients of congenital muscular torticollis who were previously non-treated underwent MR imaging. They were 8 men and 7 women, ranging in age from 1 month 10 days to 24 years 5 months. Six patients were under 1 year old and the rest were protracted by type definition. MR imaging was accomplished with a 1.5 T superconducting system (Signa, General Electric Medical System, Milwaukee, WI, U.S.A.) using head coil or anterior-neck coil. For most patients the scanning protocol consisted of axial and coronal T1 weighted image 360/15/4 (TR/TE/excitations) a matrix of 256 × 192, axial T2 weighted and proton density weighted image 2000/80, 40/2 a matrix of 256 × 128. A slice thickness of 5mm with 1mm gap and a 16cm field-of-view were used. Contrast enhancement

was performed in 6 patients with Gd-DTPA at a dose of 0.1 mmol/kg (Magnevist, Nihon Schering). To depict the lesion of the sternocleidomastoid muscle, we order the T1 weighted, T2 weighted and proton density weighted images in 3 grades : excellent, good and poor (Table 1). According to signal intensity of the proton density weighted image, the lesions are classified into 4 types (Table 2): Type 1, localized high signal intensity ; Type 2, reticular pattern of high and low signal intensity ; Type 3, reticular pattern of low signal intensity ; Type 4, localized low signal intensity.

RESULTS

To depict the lesion of the sternocleidomastoid muscle, proton density weighted images are superior to the T1 weighted and T2 weighted images (Table 1).

The patients under 1 year old were treated with cap brace therapy which could roll the head free for conservative treatment of congenital muscular torticollis[2]. Two among 6 patients of under 1 year old underwent plural MR imaging during treatment. One patient of 1 month 10 day old female underwent 4 times of MR imaging and the other patient of 4 month old male underwent 5 times of MR imaging during treatment. The signal intensity of the lesions on proton density weighted images gradually changed from high signal intensity to low signal intensity as both of the patients grew older (Fig.1). According to signal intensity of the proton density weighted image, the lesions are able to be classified into 4 types as mentioned above (Table 2). Figures of each types are illustrated from Fig.2 to Fig.5. Based on these observations, we classified all cases of proton density weighted images of initial examination according to types and ages (Table 3). Of six patients who were under one year old ; 3 belonged to type 1, the remaining 3 belonged to type 2. Of nine patients who were over 1 year old ; 5 belonged to type 3, 4 belonged to type 4.

We examined 6 cases of torticollis with contrast enhancement. Three belonged to type 3 and 3 belonged to type 4. All patients were over 1 year old. No evidence of abnormal enhancement was demonstrated on T1W image, but rather clearly visualized a low signal intensity lesion of the affected side (Fig.6).

Table 1 Comparison of T1W, T2W and proton density weighted images to depict lesion

Image \ Grade	excellent	good	poor
T1 weighted image	4	3	8 (cases)
T2 weighted image	5	2	8
Proton density weighted image	14	1	0

Table 2 Classification of MR findings according to signal intensity of proton density weighted image

Type 1	Localized high signal intensity
Type 2	Reticular pattern of high and low signal intensity
Type 3	Reticular pattern of low signal intensity
Type 4	Localized low signal intensity

Table 3 Classification of proton density weighted image according to types and ages on initial examination

Age \ Type	1	2	3	4	Total (cases)
<1 year	3	3	0	0	6
<10 years	0	0	4	2	6
>10 years	0	0	1	2	3

DISCUSSION

MR imaging is a good modality to examine lesions of the musculoskeletal system[3)-5)]. Mass in the sternocleidomastoid muscle of congenital muscular torticollis is well visualized on proton density weighted images in this study. Whyte and his colleagues[6)] first reported a case of a 10-year-old girl with left sided torticollis. MR of the neck showed abnormal shape and decreased signal intensity of the affected sternocleidomastoid muscle on a T1 weighted image. No T2 weighted or proton density weighted image appeared. Whyte's findings were consistent with muscular fibrosis subsequently demonstrated in histopathological examinations following surgical treatment. The patients of our cases were classified by imaging patterns of the lesions in the sternocleidomastoid muscle at initial examination. All six patients under 1 year old belonged to type 1 or 2, had high signal intensity in the lesion. On the other hand, all 9 patients over 1 year old belonged to type 3 or 4. That is, high signal intensity lesions were frequently seen in younger patients and low signal intensity lesions were seen in elder patients. In general, edema and edematous lesions demonstrated high signal intensity on T2 weighted and proton density images but iso- or mild low signal intensity on T1 weighted images[7)]. On the contrary, the lesions with little or no signal on T2 weighted images may be the result of low proton density as seen in some fibrous lesions, scar tissue and so on[8)]. We regard type 1 as MR presentation pattern of edema. Types 2 to 4 show the process of fibrotic change.

Ultrasonography is a useful method for evaluating neck mass and also utilized for examining children of congenital muscular torticollis. Chan and his colleagues[9)] reported systematic

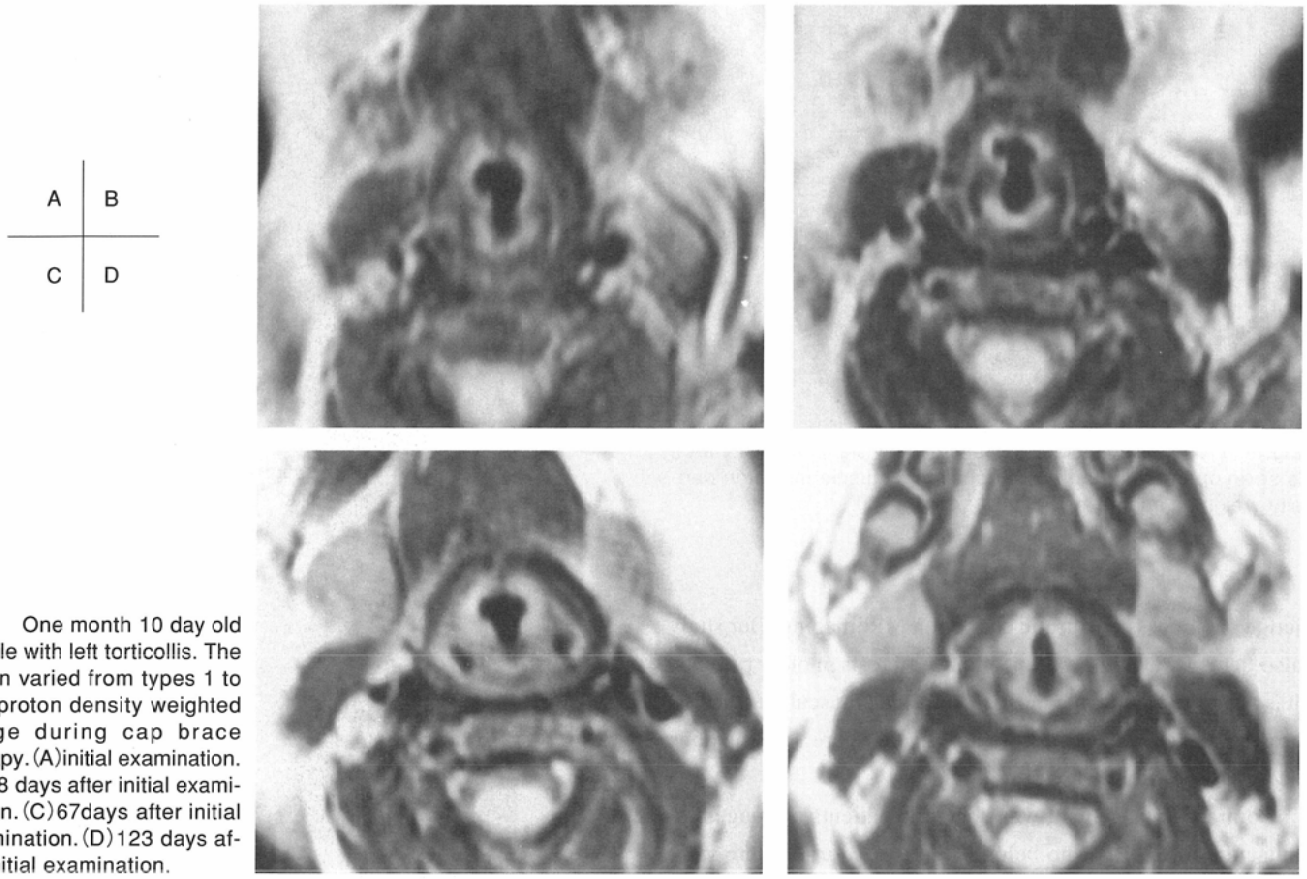


Fig.1 One month 10 day old female with left torticollis. The lesion varied from types 1 to 4 in proton density weighted image during cap brace therapy. (A)initial examination. (B)28 days after initial examination. (C)67days after initial examination. (D)123 days after initial examination.

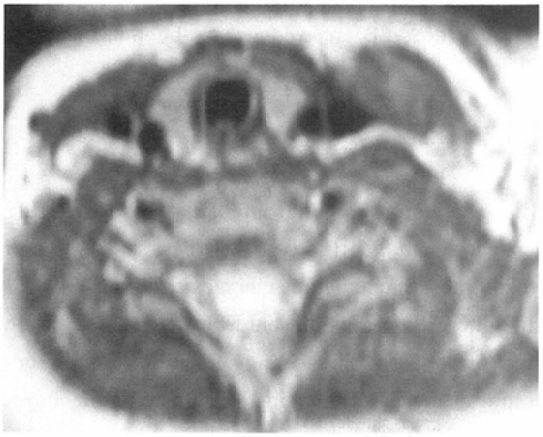


Fig.2 Type 1. Four month 11 day old female. High signal intensity area is visualized on the left sternocleidomastoid muscle in proton density weighted image.

Fig.3 Type 2. One month 14 day old male. Reticular pattern of high and low signal intensity area is visualized on the right sternocleidomastoid muscle in proton density weighted image.

Fig.4 Type 3. Five year old female. Reticular pattern with only low signal intensity is seen on the right sternocleidomastoid muscle in proton density weighted image.

ultrasound study of congenital muscular torticollis. The ultrasound appearance of the masses have a patchy or homogeneous echo-texture. No ultrasonography of the progress of the lesion was demonstrated. They stated that the patchy echo-texture is more commonly seen in the one month group and may correspond to the early edematous stage with early degeneration of muscle fibers. The homogeneous echo-texture of the masses are seen at a later stage, but patchy echo-texture still exist at 8-24 months of age. That shows degeneration of muscle fibers are still in progress even in some older patients. It is easy to

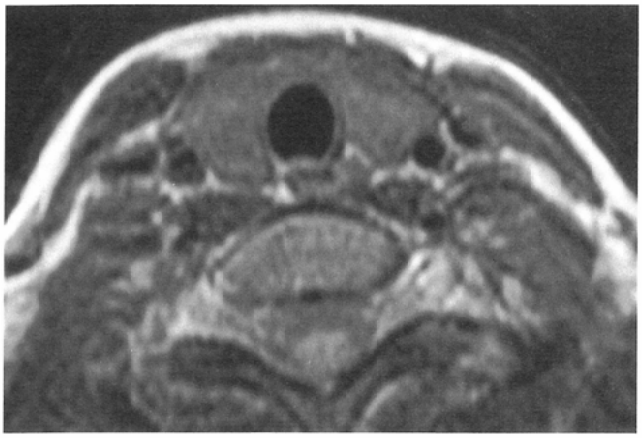
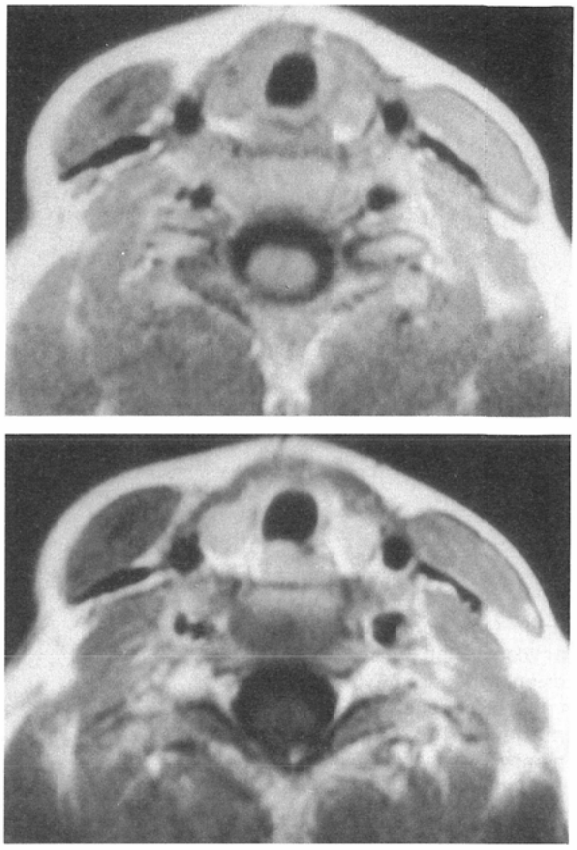


Fig.5 Type 4. Eleven year old female. Low signal intensity area is seen on the right sternocleidomastoid muscle in proton density weighted image.



(A) (B)

Fig.6 Three year 7 month old female. Rather thickened muscle with low signal intensity area is identified on the right sternocleidomastoid muscle in T1W image (A). After Gd-DTPA injection (B), no evidence of abnormal enhancement is identified.

judge the process of fibrotic change on MR imaging. Our study also demonstrate type 3 of incomplete fibrosis in older patients. It is suggested that while most of congenital muscular torticollis are completed fibrosis within a year, there are some lesions accomplish a fibrosis over one year.

Contrast enhancement was done to 6 patients of congenital muscular torticollis who belonged to type 3 or 4. There were no abnormal enhancements of the lesions. Contrast enhancement is useless in patients with fibrotic change of the lesion.

It is suggested that when the lesion demonstrates low signal intensity of fibrotic change at initial examination with torticollis posture, the patient needs surgery. When it is altered from types 1 or 2 to types 3 or 4 of low signal intensity during conservative treatment, surgery is needed in patients still demonstrating torticollis posture.

CONCLUSION

Proton density weighted imaging is proper for the depiction of mass of congenital muscular torticollis. The patterns of MR findings can be classified into 4 types which express the stages of torticollis. The lesion of signal intensity on MR imaging gradually changes from type 1 to type 4. Types 1 and 2 of high signal intensity present edematous changes and types 3 and 4 of low signal intensity lesions present fibrotic changes. There was no effect of contrast enhancement for types 3 and 4 because of fibrotic changes. MR imaging is valuable for the judgement and in selection of treatment of congenital muscular torticollis.

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