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Review

T1 AND T2 MAPPING IN CARDIAC MRI

Kardiyak MRI da T1 ve T2 Haritalama

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Abstract: In the recent years, according to the development in magnetic resonance imaging (MRI) , the parallel imaging techniques such as T1 and T2 mapping have been the guide for diagnosis. Mapping technics give ideas about tissue characterization. In this review, we mention about T1 and T2 mapping in cardiac MRI.

Keywords: cardiac, MRI, mapping

Özet: Son yıllarda manyetik rezonans görüntülemedeki (MRG) gelişmelere göre T1 ve T2 haritalama gibi paralel görüntüleme teknikleri tanıda yol gösterici olmuştur. Haritalama teknikleri doku karakterizasyonu hakkında fikir verir. Bu derlemede, kardiyak MRG'de T1 ve T2 haritalamasından bahsedilmiştir.

Anahtar Kelimeler: kardiyak, MRI, haritalama

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1.Introduction

Cardiac magnetic resonance imaging (MRI) is a very important tool for the assessment of the heart. With the recent innovations, progress has been made in cardiac MRI.

Tissue characterization techniques such as T1 and T2 mapping have entered our lives with these advances in MRI. With these imaging techniques, an increase in the diagnostic accuracy of MRI was observed. Native T1 mapping is a precontrast technic. But when extracellular volume(ECV) needs to be calculate, T1 mapping also taken after contrast media(1). Modified look-locker inversion recovery (MOLLI) is used for T1 mapping and ECV, T2-prepared balanced steady state-free precession is used for T2 mapping(2). T1 and T2 mapping guides the diagnosis, and we will discuss these techniques here.

T1 Mapping:

Depends on the progress in MRI, we can measure T1 value pixel by pixel and we can create colur coded maps according to these values in T1 mapping. Contrast is not needed when creating it . It is called native T1 mapping. Native T1 mapping provides information about edema, fibrosis, and iron accumulation. MOLLI is mostly used for it. But limitation is too long for the patient with one breath hold. Except MOLLI pulse squence, there are more options like shortened MOLLI, the saturation recovery single-shot acquisition (SASHA) and other MOLLI variants (3,4).

Normal native T1 values with acquired using MOLLI technic is 930 +/- 21 ms at 1.5 T MR, and 1052 +/- 23 ms in 3T MR (5).

In acute myocardial infarction, T1 mapping value is higher as a result of edema. In chronic myocardial infarction T1 mapping value is higher according to the fibrosis (6). In acute ischemia and infarction zones, native T1 and T2 relaxation times is getting longer, and post contrast T1 time is getting shorter (7). Native T1 mapping is also used for the discrimination of the hypertrophic cardiomyopathy and hypertensive heart disease (8).

T1 values increase in acute myocarditis and chronic convalescent form according to the healthy group (9).

Diffuse myocardial fibrosis can sometimes be overlooked when myocardial tissue is researching with late gadolinium enhancement (LGE). In LGE, myocardial signal intensity is close to isointense or appears as normal when diffuse myocardial fibrosis occurs. In this case, post-contrast T1 and ECV are used for diagnosis (10).

In Fabry disease, T1 mapping is as corner stone for the diagnosis. Decreased T1 value shows cardiac involvement of the Fabry disease (11). And also myocardial decreased T1 values can be related with iron overload(12).

T2 Mapping:

T2 mapping is another tissue charcterization technic. It can not be considered separately from T1 and ECV.

Normal myocardial T2 mapping value is 52.18 +/-3.4 ms at 1.5 T, 45.1 ms at 3T(13). Parametric imaging show prolonged relaxation time in T1 and T2 during acute edema(14). T2 value is higher in cardiomyopathy related with the edema (15). And also T2 star mapping is a valuable technic for the iron overload(16).

2.Conclusion

Cardiac MRI is an important technique that guides the diagnosis. Myocardial tissue characterization and left ventricule function can be assessed in cardiac MRI. According to the imaging included parametric techniques, patients gets a specific diagnosis. T1 and T2 mapping are valuable for the patient and future directions.

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