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Macromolecular Clearance from the Ventricles by Choroid Plexus in Experimental Hydrocephalus

Satish Krishnamurthy MD, MCh; Jie Li MD, PhD; Yimin Shen; Mark Haacke

Introduction

Choroid plexus is known to be the source of cerebrospinal fluid and therefore, has been the target of surgical destruction or coagulation in the treatment of hydrocephalus. The role of choroid plexus in the homeostasis of the cerebrospinal fluid is unclear in the presence of hydrocephalus.

Methods

We performed experiments to study the distribution and kinetics of iron labeled dextran in rats using a 7T MRI scan for a period of two hours during and immediately following injection. Rats were randomly divided into three groups: normal (n=9), communicating hydrocephalus induced by kaolin (n=11) and obstructive hydrocephalus induced by kaolin (n=4). Presence of iron tagged dextran in the choroid plexus was determined as a change in the MRI signal (decreased T2 value) and histology after sacrifice of the animals

Conclusions

Choroid plexus plays a beneficial role in the clearance of macromolecules from the CSF in both normal and hydrocephalic states.

Learning Objectives

By the conclusion of this session, participants should be able to 1) describe the role of choroid plexus in hydrocephalus 2) describe the role of macromolecular clearance.

Results

MR data was measured at three different time points: preinjection, 35 minutes post and 79 minutes post injection. We found that in all groups there was uptake of iron tagged dextran into the choroid plexus. While the T2 vlaues of CP returned baseline at 79 minutes in normal, while these values were still far below the baseline in kaolin induced hydrocephalus groups and these were statistically significant ($p<0.05$).

Normal rat, CP T2 values 101±5(n=18) (pre), 64±1(35m post), 92±1 (79m post). Hy-BC rat, CP T2 values 148±26(n=76) (pre), 60±4(35m post), 71±8(79m post). Hy-CM rat, CP T2 values156±32(n=53) (pre), 39±6(35m post), 35±4(79m post). Histopathology confirmed the presence of dextrans in the choroid plexus. Spectrophotometric assay of serum and urine revealed that dextrans were detected in both with a peak in the serum at 30 mins and peak in the urine at 45 mins.

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