

# Assessment of Pituitary Stalk Anatomy by T2 DRIVE without Gadolinium in Pituitary Diseases

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## Objectives:

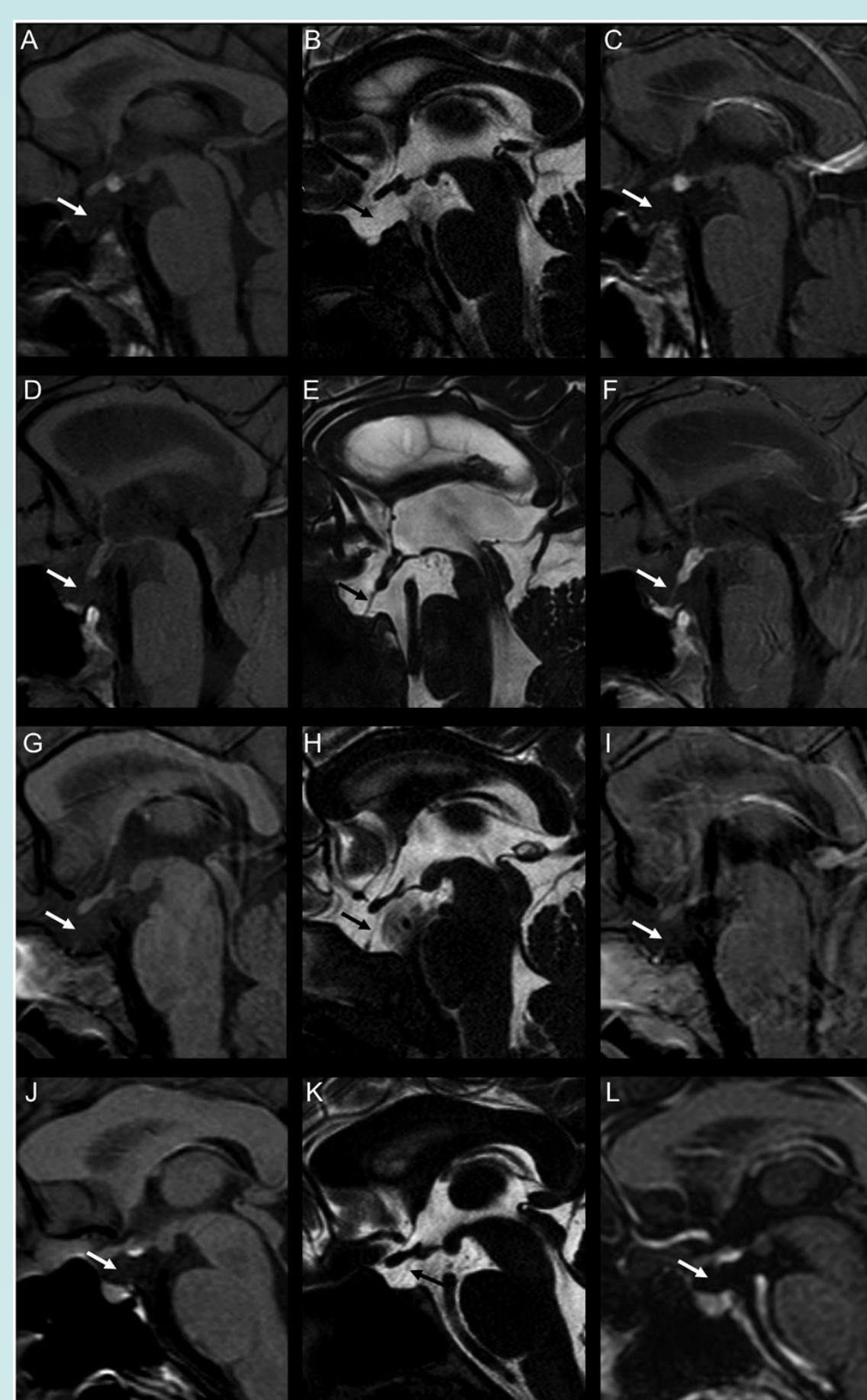
Aim of our study was to evaluate the potential diagnostic role and sensitivity of T2-weighted DRIVE sequence in pituitary stalk (PS) identification and measurements in patients with hypothalamic-pituitary disorders. The degree of agreement and reliability between standard pre- and post-contrast T1-weighted images and T2-DRIVE has been tested in a large group of patients with pituitary dysfunction.

## Methods:

Design: We searched for pituitary MRI reports using "T2-DRIVE" in our Institutional database between 2006 and 2015.

Among eutopic posterior pituitary (PP) patients, only studies including sagittal 3-mm thick T1-weighted images acquired before and after contrast material administration in addition to sagittal T2-DRIVE images were included for analysis; among patients with 'ectopic' PP (EPP) gland, only those with T1-weighted sagittal images and T2-weighted coronal images (3 mm thick) were enrolled. The T2-DRIVE sequence was acquired on the sagittal plane with a slice thickness of 0.6 mm. All MRI scans were performed with a 1.5 T MR system (Intera Achieva 2.6; Philips). Among 135 eligible patients, 102 showed eutopic PP gland and with pituitary dysfunction of different etiologies and 33 showed EPP (fig.1) associated with anterior pituitary defects.

In patients with eutopic PP, two independent readers measured the PS size in the sagittal plane, drawing a line perpendicular to the axis of the major stem at three levels: proximal, midpoint, and distal on pre- and post-contrast T1-weighted and on T2-DRIVE images. The pituitary stalk was assessed on pre-contrast T1 and T2-DRIVE sequences in those with EPP. Cohen's kappa coefficient was then used to evaluate the chance-correct concordance for the case between two different sequences that are expressed in the form of categorical data.



**Fig. 1 Pituitary stalk (PS) visibility in subjects with ectopic posterior pituitary (PP).** Left column: sagittal 3-mm-thick pre-contrast T1-weighted images; middle column: sagittal 0.6-mm-thick T2-DRIVE sequence; right column: sagittal 3-mm-thick post-contrast T1-weighted images. (A, B and C) 13-year-old girl with MPHD and lack of visibility of the PS in all sequences (arrows, A, B and C). The PP is located at the level of the median eminence (ME). There is concomitant marked reduction in size of the anterior pituitary (AP). (D, E and F) 11-year-old boy with GHD, TSHD and septo-optic dysplasia spectrum. The distal PS is not visible on the pre-contrast T1-weighted image (arrow, D), whereas it is clearly visible on both T2-DRIVE and post-contrast T1-weighted images (arrows, E and F). The PP is located along the proximal and mid stalk. The AP is hypoplastic. (G, H and I) 1-year-old boy with MPHD. The proximal and mid portions of the PS are not visible on the pre-contrast T1-weighted image (arrow, G), are barely visible on the post-contrast T1-weighted image (arrow, I) and are clearly visible on T2-DRIVE (arrow, H). A tiny PP is located at the level of the ME. There is marked hypoplasia of the AP. (J, K and L) 29-year-old girl with GHD, LH/FSHD and CDI. The PS is not visible on pre- and post-contrast T1-weighted images (arrows, J and L). T2-DRIVE sequence allows the detection of a thin structure connecting the ME to the pituitary fossa, likely representing an extremely thinned PS (arrow, K). The PP is located at the level of the ME. The AP is normal.

Pituitary stalk	ICC (95% CI)		P value
	T1 pre-contrast	T2 DRIVE	
Proximal	0.89 (0.83–0.92)	0.96 (0.94–0.97)	<0.001
Midpoint	0.85 (0.78–0.89)	0.99 (0.98–0.99)	<0.001
Distal	0.76 (0.66–0.83)	0.97 (0.96–0.98)	<0.001
Pituitary stalk	T1 pre-contrast	T1 post-contrast	
	Proximal	0.89 (0.83–0.92)	0.88 (0.83–0.92)
	Midpoint	0.85 (0.78–0.89)	0.87 (0.81–0.91)
Distal	0.76 (0.66–0.83)	0.79 (0.70–0.85)	
Pituitary stalk	T2 DRIVE	T1 post-contrast	
	Proximal	0.96 (0.94–0.97)	0.88 (0.83–0.92)
	Midpoint	0.99 (0.98–0.99)	0.87 (0.81–0.91)
Distal	0.97 (0.96–0.98)	0.79 (0.70–0.85)	<0.001

Table 1 Inter-reader agreement (EG vs GM) measured by the intraclass correlation coefficient (ICC) with 95% confidence intervals (95% CIs).

## Results:

The agreement between the measurements of the two readers showed that the ICC in the T2-DRIVE sequence was 0.96 at the proximal level of the PS, 0.99 at the midpoint level and 0.97 at the distal level. In pre-contrast T1-weighted sequence, the ICC was 0.89 (proximal part), 0.85 (midpoint), and 0.76 (distal part) (table 1). Finally, on the post-contrast T1, the ICC was 0.88 at the proximal, 0.87 at the midpoint and 0.79 at the distal PS levels. A significant difference between the ICC on the T2-DRIVE and the pre- and post-contrast T1-weighted sequences was demonstrated. The percentage of PS identified by T2-DRIVE in EPP patients was 72.7% compared to 30.3% of T1 pre-contrast sequences. A significant association was found between the visibility of PS on T2-DRIVE and the height of AP.

## Conclusions:

T2-DRIVE sequence is a precise and reliable tool for the evaluation of PS size and the recognition of PS abnormalities; the use of gadolinium does not add significant information. T2-DRIVE images allow for a better diagnosis of pituitary gland and PS disorders. A sagittal T2-DRIVE sequence without gadolinium takes less than 3 minutes to acquire, and its inclusion into routine sellar MRI protocols is recommended as a valid alternative to post-contrast imaging which - also in view of safety issues - may be avoided in subjects with pituitary disorders without evident sellar/suprasellar mass lesions.

## References:

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