

Neurosurgical Forum

LETTERS TO THE EDITOR



Structural retinotopic analysis at 7-Tesla MRI in pituitary macroadenomas

TO THE EDITOR: We read the article by Rutland et al.¹ with great interest (Rutland JW, Delman BN, Huang K-H, et al. Primary visual cortical thickness in correlation y kv j " xkuwcn" fgnf" fgheguv" kp" rckvgpvu" ykvj" rkvwkvc{ " o ce- tqcf gpgq o cuk" c" uvtwevwtcn" 9/Vgunc" tgvkpqvkrke" cpcn{ uku" }rwd- lished online October 18, 2019]. *J Neurosurg.* doi:10.3171/2019.7.JNS191712).

Hktuv." y g" y qwnf" nkmng" vq" eqpi tcvwncvg" v j g" cwv j qtu" hqt" wu-
ing 7-Tesla (7T) MRI to investigate the secondary damage
qh" v j g" xkuwcn" eqtvgz" v j cv" o c{ " dg" cwtkdwvgf" vq" v j g" tg o qvg"
ghhgev" qh" ejkcu o cvke" eq o rtguukqp" kp" rcvkgpvu" y kv j" rkvw-
kvct{ " o cetqcf gpq o cu" *ROCu0" V j g{ " hqwpf" v j cv" v j g" i nqdcn"
v j kempguu" qh" X3" kp" rcvkgpvu" y kv j" ROC" ycu" itgcvgt" v j cp"
v j cv" kp" eqpvqtqu." cnv j qwi j" v j g" fkhhtgtpegu" y gtg" pqv" uvcvkuvk-
ecnn{ " uki pk{ tcvp0" Kpvtgtuvkp i n{ " v j g" eqtkvecn" v j kempguu" y cu"
uki pk{ tcvp n{ " fgetgcugf" cv" v j g" o g fkc p" dqv v q" 32 v j" r tgegp-
vkng" qh" X3" v j kempguu" kp" ROC" rcvkgpvu0" Oqtgqxgt." rqukvkxg"
eqttgncvkqpu" dg v y ggp" X3" v j kempguu" tcvkqu" cpf" rcvvgtp" fg-
xkcvkqp" o gvtken" y gtg" fg o qpvtcvgf" kp" c n n" rcvkgpvu0" Y g" cr-
rtgekcvg" v j g" uki pk{ tcepeg" qh" v j g u g{ " p fkp i u" cpf" v j g" cr nkec-
vkqp" qh" 9V" OTK" kp" v j g" enkpkecn" ugwkpi" hqt" v j g" swcpkvkcvxg"
cuuguo o gpv" qh" v j g" rvgvgtktq" xkuwcn" rcv j yc{0" J qy qxgt." y g"
would like to highlight some methodological issues that
u j qwnf" dg" c f f tguugf" kp" h wvwtg" u v w fku0)

Kv"uvkn"tg o c kpu"eqpvtqxtgukcn" y j g v jgt"9V" O TK"ku"uwrg-
rior to 3T MRI in cortical thickness estimation. The 7T
O TK"uecppgtu"ecp" igpgtcnn{ "ceswktg" k o c i g u" y k v j" c" j k i jgt"
ukipcn/vq/pqkug" tcvkq. " cpf" v j g" o c i p g v k | c v k q p / r t g r c t g f" 4"
tcrkf" ceswkukvqp" itcfkpv" gejq" *OR4TCIG+ " u g s w g p e g"
has been widely used in imaging the brain microstruc-
ture at a submillimeter scale.² However, it is known that
V3/ygk i jvgf" k o c i g u" ceswktgf" qp" 9V" uecppgtu" uwhhgt" v j g"
transmit and receive B₁-related imaging inhomogeneities,
cpf" V3/ygk i jvgf" k o c i g" swcnkv{ " ecp" jgcxkn{ " chhgev" eqtvk-
construction.² Seiger et al.³ r g t h q t o g f" c" u{ u v g o c v k e"
eq o r c t k u a p" d g v y g g p" e q p x g p v k q p c n" 5V" O R T C I G" uecpu"
cpf" 9V" O R 4 T C I G" uecpu" k p" v j g" g u v k o c v k q p u" q h" i t c{ " o c v-
vgt" x q n w o g" * I O X + " V j g f" h q w p f" c" j k i j g t" I O X" k p" u g x g t c n"
xkuwcn" t g i k a p u" * k p e n w f k p i" h w u k h q t o" i{ t w u. " o k f f n g. " c p f" k p-
h g t k q t" q e e k r k v c n" i{ t w u+ " c p f" c" j k i j g t" v g u v / t g v g u v" t g n k c d k n k v f"

at 3T.³ Moreover, the residual B₁ transmit imaging inhomogeneity is not corrected by the B₁ transmit imaging inhomogeneity corrections on OR4TCIG.⁴ Jccuv{gv cnl} jcxg{hqwpf} vjcv{c f f k tional B₁ transmit imaging inhomogeneity corrections on OR4TCIG.⁴ k o c i g u k i p k f e c p v n { k o r t q x g v j g c e e w t c e { q h e q t v k e c n v j k e m p g u u { o g c u w t g o g p v u e q o r c t g f y k v j w p e q t r e c t e d o n e s . V j g u g t g u w n v u t c u g c e t w e k c n s w g u v k p c t g 9 V u e c p p g t u p g e g u u c t { h q t f g v g e v k p i c v r k e c n c p c v q o k e c n u t w e w t g u k p r c v k g p y k v j R O C u K x g p v j g n q y g t c e e g u u d k d n k v { c p f j k i j g t e q u v q h 9 V e q o r c t g f v j g 5 V u e c p p g t u . v j g p g e g u u c t { q h w u k p i 9 V O T K p v j g u t w e w t c n t g v k p q v r k e c p c n { u k u k p R O C u u k n n p g g f u v q d g h w t v j g t g z r n a t g f 0

Yg'p'p'q'v'j'c'v'j'k'u'uw'f'{'j'c'u'd'g'g'p'encuuk'f'g'c'u'c'rt'qur'ge-
v'k'x'g'uw'f'{'f'j'q'y'g'x'g'.'v'j'g'p'g'w't'g'q'r'j'v'j'c'n'o'q'n'q'ikec'n'f'c'v'c'y'c'u'
eq'n'g'e'v'g'f't'g'v't'g'p'g'v'k'x'g'n'{'c'p'f'v'j'g't'g'h'q't'g'k'v'y'q'w'f'd'g'w'g'h'w'n'
v'q'eq'p'f'w'e'v'v'j'k'u'r'c't'v'q'h'v'j'g'uw'f'{'rt'qur'ge'v'k'x'g'n'{'0'V'j'g'uw'f'{'
k'p'e'w'f'g'u'c'u'o'c'n'n'uc'o'r'n'g'uk'g.'c'p'f'v'j'g't'g'h'q't'g'v'v't'k'e'v'k'p'e'n'w'uk'q'p'
e't'k'y'g't'k'c'o'w'w'd'g'w'g'f'0'V'j'g'r'c'v'k'g'p'v'c'p'f'eq'p'v't'q'n'i't'q'w'r'u'y'g't'g'
k'p'f'g'g'f'o'c'v'e'j'g'f'd'{'c'ig'c'p'f'ug'z'j'q'y'g'x'g'.'y'g'y'q'w'f'n'k'm'g'v'q'
j'k'i'j'k'i'j'v'j'c'v'j'g'x'k'u'w'c'n'f'g'n'f'o'c'{'c'u'q'd'g'c'h'h'e'v'g'f'k'p'r'g'q'r'g'
y'k'v'j'j'k'i'j'o'{'q'r'k'c.'i'n'c'w'e'q'o'c'.^{6,7} and macular disease,⁸ and
v'j'g't'g'h'q't'g'c'f'f'k'v'k'p'c'n'uw'r'u'v'q'v'q'g'f'w'eg'eq'p'h'q'w'p'f'k'p'i'h'ec'v'q'tu'
should be taken into account. We suggest that detailed eye
g'z'c'o'k'p'c'v'k'q'p't'g'u'w'w'u'ht'q'o'r'c't'v'k'ek'r'c'p'v'u'uw'e'j'cu'k'p'v't'c'q'ew'n'c't'
r't'g'u'w'w't'g'c'p'f'f'k'q'r'v'g't'k'p'ur'ge'v'k'q'p'd'g't'g'e'q't'f'g'f'0'V'q'x'k'u'w'c'n'k'g'
the anatomy and rule out other diseases, we recommend
v'j'c'v'h'w'p'f'w'u'r'j'q'v'q'i't'c'r'j'{'c'p'f'q'r'w'c'e'n'eq'j'g't'g'p'eg'v'q'o'q'i't'c'-
r'j'{'u'ec'p'u'uj'q'w'f'd'g'eq'p'f'w'e'v'g'f'q'p'c'n'n'r'c'v'k'g'p'v'u'y'k'v'j'RO'C'0'
Y'g'j'q'r'g'q'w't'f'k'u'e'w'w'uk'q'p'u'c'p'f'uw'i'g'v'k'p'p'u'ec'p'h'q'u'v'g't'i't'g'c'v'-
g't'g'ug'c't'e'j'k'p'v'g't'g'u'v'k'p'v'j'g'o'g'e'j'c'p'k'u'o'u'q'h'RO'Cu'l

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- 80" Pkvc" M. "Uwik { c o c" M. "Ycl o c" T. "Vcejkdcpc" I 0/ Ku" jki j" o { q- rkc" c" tkum" hcevqt" hqt" xkuwcn" fgnf" rtqi tguukqp" qt" fkum" jg o qt- tjcig" kp" rtk o c t { "qrgp/ cping" incweq o cA" Clin Ophthalmol. 2017;11:599–604.
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Disclosures

The authors report no conflict of interest.

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Response

Yg"vjcpm" [cq"gv" cnd" hqt" vjgkt" kpvtguv" kp" qwt" tgegvp" rwd- nkecvkp0" kp" vjku" uvwf { "y" g" uqwi j" vq" vcmg" c fxcpcig" qh" cxckn- cdng" jki j/ tguqnvkvqp" 9V" uecpv" vq" rgtgt o "eqvtkecn" vj kempguu" cuuguu o gpv0" Cmvjqwi j" wnvte jki j/ fgnf" OTC" o c { "pqv" dg" pgeguuct { "hqt" fgvgevkpi" ejcpigu" kp" eqvtkecn" vj kempguu. "9V" ku" c" wughwn" vqqn" hqt" uvwf { kpi" uvtwevwtcn" tgvkpqvkrke" ejcpigu" kp" vjg" eqpvz" qh" rkvwkvt { "c" fgpq o c" fwg" vq" vjg" tguqnvkvqp" cpf" eqpvteuv" c fxcpcig" k o rctvgf" d { " jki j/ fgnf" uecpvgtu0" Vjgug" tguwvu" o c { "gxgpwcn" { "dg" vtepcncvgf" vq" rgtgt o - kpi" uk o knct" uvwfkgu" cv" 5V" ykvj" nqygt" rgt o kvvgf" tguqnvkvqp" cpf" nctigt" uc o rng" uk | gu0" Hwtvjt o qtg. "9V" uecpvgtu" ctg" kpetgcuipn { "cxckncdng" ukpeg" tgegvp" HFC" cpf" Eqphqt o kv2" Gwtqr2gppg" cr r txcn. " ykvj" cv" ngcu" : 9" y j qng/ dqf { " OTC" u { uvg o u" qh" 9V" qt" i tgcvgf" fgnf" uvtgpi vj " kpuvcnmgf" y qtnf y kfg" cu" qh" Fgeg o dgt" 423; 0/ Vjgug" 9V" uecpvgtu" qhgt" gzswwkvvg" ugpukvkv { "cpf" tguqnvkvqp" hqt" k o c i kpi" o qf cnkvku" tgs wktgf"

to detect subtle alterations in structure, metabolism, and connectivity in various neurological diseases.^{1–3}

While we acknowledge that signal-to-noise ratio and eqpvteuv"kp" egtvckp" dtckp" tgi kpuu" uwhgt" htq o "kpetgcugf" D1" kpj q o qigpgkv { "cv" wnvte jki j" fgnf. "kp" qwt" gztgkpgpeg. "vjku" ku" nguu" qh" c" rtqdg o "kp" vjg" rtk o c t { "xkuwcn" eqvtg" vj cp" kp" rqt- vkpuu" qh" vjg" dtckp" kp" enugt" rtqzk o kv { " ykvj" vjg" umwvn" dcug0" Ectghwn" rnceg o gpv" qh" fkgngvte" rcfu" cpf" cflwuv o gpv" qh" vjg" transmit B1" vq" rtqxf" vjg" o quv" wpkht o "D1" rtqf ngu" kp" vjg" tgi kpuu" qh" kpvtguv" ygtg" g o r nq { gf" kp" vjku" uvwf { " vq" o kpk- mize transmit B1" kpj q o qigpgkv { 0" Yg" wugf" vjg" OR4TCIG" ugswwpeg" kp" y jke j { "Ekr" cpingu" ctg" qrvk o k | gf" vq" etgcvg" k o - cig" eqpvteuv" vjcv" ycu" kpfg r gpf gpv" qh" vjg" tgegrkvqp" D1" fgnf" JD1" } cpf" ncti gn { "kpfg r gpf gpv" qh" vjg" vtcpu o kuukqp" D1" fgnf" JD1. } .4 This more homogenous T1-weighted image, called vjg" WPKFGP" k o c i g. " ku" etgcvgf" d { " eq o d k p kpi" v y q" fkh- hgtgpv" i tcfkpv" gejq" k o c i g" ykvj" v y q" fkhgtgpv" kpxgtukqp" vk o g" rtqfwegf" d { " OR4TCIG04.5

Tgfwekpi" vjg" ghghev" qh" kpj q o qigpgquu" vtcpu o kv" D1" fgnf" cv" 9V" ku" cp" cevkg" ctgc" qh" tgugete j0" Uqnvkvqp" kpenwfg" vjg" wug" qh" rctcmgn" vtcpu o kv" eqknu" cpf" wpxgtucn" tcfkhtgswge { " rwnugu" vq" cejkgxg" c" o qtg" wpkht o "D1" rtqf ngu0.6,7 This could rtqxf" y j qng/ dtckp" wpkht o " OR4TCIG" k o c i g" cv" vjg" higher resolution achievable by 7T MRI.

Nwugdtkpm" gv" cnd" u { uvg o kecn { " eq o rctgf" vj kempguu" qh" vjg" jw o cp" egtgdctn" eqvtg" wukpi" 5V" cpf" 9V" cpf" hqwpf" eqpukuvgpv" tguwvu" cetquu" fgnf" uvtgpi vj u. eqp i t o kpi" vjg" xcnkfv { " qh" eqvtkecn" vj kempguu" o gcuwtg o gpv" cv" wnvte jki j" fgnf08 However, the average cortical thickness was shown to be greater at 3T and Lusebrink et al. concluded that 5V" qxgtguv o cvgu" eqvtkecn" vj kempguu" cu" c" tguwv" qh" rctvken" xqmw o g" ghghev. " y jke j" ctg" i tgcvgf" cv" nqygt" fgnf" uvtgpi vj 0" Vjku" rvgpvken" qxgtguv o cvkqp" eqwnf" eqpvtdwyg" vq" vjg" jki jgt" itc { " o cvgt" xqmw o gu" tgrqtvgf" d { " Ugkigt" gv" cnd" wu- kpi" 5V. uwi i guvki vjcv" 9V" OTC" o c { " dg" wughwn" kp" o kvki cv- kpi" xqmw o g" cxgtc i kpi" ghghev09 Fwg" vq" c" u o c n" pw o dgt" qh" uvwfkgu" eq o rctkpi" 5V" cpf" 9V. vjgtg" ku" ewt tgpv { " pqv" c" fpcn" eqpugpuu" qp" vjg" qrvk o c n" o c i pgvke" fgnf" uvtgpi vj " hqt" jki j/ tguqnvkvqp" rtgekukqp" xqmw o gvtke" swcpk fcevkqp" qh" eqvtkecn" thickness. More research in this area is warranted to de- vgt o kpg" rtghgtgf" fgnf" uvtgpi vj u" hqt" urgek f e" cr r nkecvkpu" uwe j" cu" tgvkpqvkrke" k o c i kpi" qh" rkvwkvt { " c fgpq o c0

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- ":0" Nwugdtkpm"H."Yqntcd"C."Urgem"Q0"Eqtvkcn"vj kempguu"fgvgt-o kpcvkqp"qh"vjg"jwo cp"dtckp"wukpi"jki j"tguqnwvkqp"5V"cpf"9V" MRI data. *Neuroimage*. 2013;70:122–131.
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