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# From the Editors: *Epilepsia's* survey on the necessity of the Wada test and intracranial electrodes for cortical mapping

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## SUMMARY

**Objective:** From April 4 to August 1, 2014, *Epilepsia* conducted an online survey seeking opinions related to the use of the Wada test and intracranial electrodes in localizing cortical functions for epilepsy surgery patients. This study reports the findings of that poll.

**Methods:** The survey consisted of six questions. Two questions addressed: (1) If a Wada test was always necessary for patients with temporal lobe epilepsy; and (2) if magnetoencephalography (MEG) and functional magnetic resonance imaging (fMRI) data could replace intracranial electrodes in localizing cortical motor-sensory and language functions. Four questions addressed the type of medical personnel, geographic region of residence based on International League Against Epilepsy (ILAE) regions, if responders had read the paper, and if they were ILAE/International Bureau for Epilepsy (IBE) members.

**Results:** Of 115 that started the survey, 92 (80%) completed it, and most were epilepsy specialists (87%) from North America (49%) and Europe (28%). Of responders, 85% indicated that Wada tests were unnecessary for temporal lobe epilepsy surgery patients. There were differences based on residency, with 100% of those from Europe indicating that the Wada test was unnecessary compared with 75% of those from North America ( $p = 0.01$ ). Of responders, 56% indicated that intracranial electrodes were necessary to localize functional cortex.

**Significance:** This survey found that the majority considered the Wada test unnecessary for temporal lobe epilepsy surgery patients, with more of those from Europe saying it is not needed compared with North America. In addition, just over half indicated that intracranial electrodes are still needed to localize motor-sensory and language functions. These findings, although based on opinions, support that there are divergent views on the use of these procedures in epilepsy surgery patients that require additional study.

**KEY WORDS:** IAP, Wada test, fMRI, Language localization.

The first Controversy in Epilepsy series was published in the May 2014 print edition of *Epilepsia*. The focus was

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whether the Wada (intracarotid amobarbital procedure; IAP) test was necessary before patients undergo mesial temporal resection for temporal lobe epilepsy, and whether magnetoencephalography (MEG) and functional magnetic resonance imaging (fMRI) could be used to replace intracranial grid stimulation procedures for motor-sensory and language mapping.<sup>1,2</sup> In conjunction with these articles, the editors offered readers the opportunity to voice their opinions on these questions through an open access electronic poll.<sup>3</sup> This report summarizes the results of the survey.

## METHODS

The poll (see Supporting Information) was advertised through *Epilepsia's* e-Newsletter sent to >18,000 email addresses. Reminders to complete the poll were sent out the last 2 weeks before the poll closed. The survey could be completed anonymously; however, participants were asked to voluntarily provide email contact information to receive results of the poll.

The poll consisted of six questions, with an opportunity for responders to provide open comments at the end. Two of the questions related to the Controversy in Epilepsy articles, and four questions to whether the responders read the paper and their demographics. The two questions related to the Controversy in Epilepsy series asked readers if they thought the Wada (IAP) test was necessary for candidates undergoing temporal lobe epilepsy surgery, and whether MEG and fMRI could be used instead of intracranial electrodes to localize cortical motor-sensory and language functions in epilepsy surgery patients. These questions are further detailed in the Results section. The other four questions as previously asked were:<sup>4</sup>

**1** Have you read the Operational Clinical Definition of Epilepsy in *Epilepsia*?

Possible answer: Yes or No

**2** What category best describes you?

Possible answers: (A) Epileptologist (postresidency training or expertise in epilepsy; includes neurosurgeons, neuroradiologists, neuropsychologists, neuropathologists, nurses who spend considerable professional time with patients with epilepsy); (B) patients and family members of those with epilepsy; (C) general neurologist; (D) basic researcher, nurses, social workers, medical student, resident, epilepsy fellow; (E) general physician (pediatrician, internal medicine, family practice) and (F) other (and specify).

**3** What geographic location of main residence/professional activities describes you?

Possible answers were based on International League Against Epilepsy (ILAE) regional commissions and included: (A) Africa; (B) Asia/Oceania; (C) Eastern Mediterranean; (D) Europe (includes Eastern Europe, Russia, and Israel); (E) Latin America (south of U.S. border); and (F) North America (U.S.A., Canada, Caribbean).

**4** Are you a member of a chapter of the ILAE or International Bureau for Epilepsy (IBE)?

Possible answer: Yes or No.

### Data analysis

Responses were uploaded onto an electronic spreadsheet and tabulated. Responses to the questions related to the Controversy in Epilepsy series were compared with demographic information using a statistical program (StatView, SAS Institute, Cary, NC, U.S.A.) applying chi-square tests. Statistical significance was set a priori at  $p < 0.02$ .

## RESULTS

The survey opened April 4, 2014 and closed August 1, 2014. The Website was visited 869 times, with 115 individuals starting the poll and 92 (80%) completing all of the questions.

### Demographics of responders

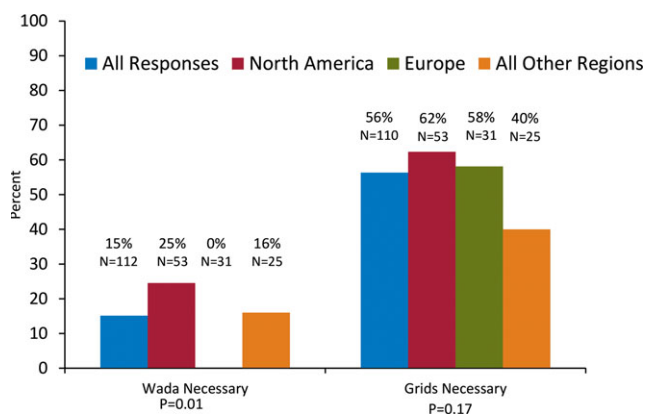
Responders represented mostly professionals in epilepsy care from North America and Europe. For the question, "Which category best describes you?" there were 109 (95%) responses. The most frequent category was epileptologist (87.2%), followed by general neurologist (5.5%), basic researcher (4.6%), nurses and social workers (1.8%), and patients (0.9%). No one identified themselves as medical student, resident, or general physician (0%). For the question, "What geographic location of main residence/professional activities describes you?" there were 109 (95%) responses. The most frequent category was North America (48.6%), followed by Europe (28.4%), Asia/Oceania (11.9%), Latin America (8.2%), Eastern Mediterranean (1.8%), and Africa (0.9%). Of responders, 57.7% (63/109) said they were members of an ILAE or IBE chapter, and 78.2% (90/115) indicated they had read the Controversy in Epilepsy series on the utility of the Wada test and language mapping for surgical patients in *Epilepsia*.

### Is the Wada (IAP) test always necessary?

The survey asked; "For patients over age 12 years with temporal lobe epilepsy who are surgical candidates, is a Wada (IAP) test always necessary before surgery?" with a yes or no response. For all responders, 15% indicated that a Wada (IAP) test was necessary before surgery (Fig. 1; left side; blue bar). Further analysis found that there were differences based on responder's self-described location of residence. More responders from North America (25%; red bar) indicated that the Wada (IAP) test was necessary compared with Europe (0%; green bar) and those from other ILAE regions (16%; Africa, Asia/Oceania, Eastern Mediterranean, and Latin America; violet bar;  $p = 0.01$ ). There were no differences to this question based on self-described professional category ( $p = 0.05$ ), if they were ILAE/IBE members ( $p = 0.07$ ), and if they had read the series or articles ( $p = 0.04$ ).

### Can noninvasive studies replace intracranial electrodes in localizing functional cortex in epilepsy surgery patients?

The survey asked; "In your opinion, can MEG and fMRI replace intracranial grid localization of motor-sensory and language functions in epilepsy surgery patients?" with a yes or no response. For all responders, 56% indicated that intracranial electrode studies were necessary in accurately localizing these cortical functions (Fig. 1; right; blue bar). There



**Figure 1.**

Responses to the following questions from all who answered the survey question (blue bars) and then separated into those from North America (red bar), Europe (green bars), and all other ILAE regions (orange bars; Africa, Asia/Oceania, Eastern Mediterranean, and Latin America): (Left) For patients over age 12 years with temporal lobe epilepsy who are surgical candidates, is a Wada (IAP) test always necessary before surgery? (Right) In your opinion can MEG and fMRI replace intracranial grid localization of motor-sensory and language functions in epilepsy surgery patients?

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were no differences to this question based on self-described geographic location ( $p = 0.20$ ; Fig. 1: right red, green and orange bar), by professional category ( $p = 0.11$ ), if they were ILAE/IBE members ( $p = 0.62$ ), and if they had read the series of articles ( $p = 0.48$ ).

### Survey comments

Written comments were received from 13 responders (10%), and are provided unedited in Supporting Information. They suggest that we should consider the use of electrocorticography (ECoG) and perhaps transcranial magnetic stimulation (TMS) as other technologies to be used for cortical localization.

## DISCUSSION

Within the limitations of an open access survey, this report supports that the majority of responders do not consider a Wada (IAP) test necessary before temporal lobe epilepsy surgery, and about half think that noninvasive studies such as MEG and fMRI can replace intracranial electrode studies in localizing motor-sensory and language cortex. Furthermore, there were differences based on residency, with 100% of those from Europe indicating that the Wada test was unnecessary compared with 75% of those from

North America. We should emphasize that the results of this survey represent opinion and not the recommendation of any expert panel or the ILAE, and should be used for informational purposes only.

Readers should likewise be aware of the limitations of this report and the survey methods. For example, the responses were unaudited and we take on trust that people were honest and forthright in completing the poll's questions. We also do not know if the survey is representative of the entire epilepsy community given the limited number of responders. We can only report the results of those that were aware of the survey and took the time to complete it. Likewise, we cannot control for individuals that might have completed the survey more than once if they logged onto the site using different computers and times. Finally, we did not subdivide responses comparing neuropsychologists from other medical specialists in epilepsy. The response might be different within these subgroups. These limitations will need to be considered in any future survey on this topic, but for our purposes indicate that the use of the Wada (IAP) test is not supported and there are divergent views on whether noninvasive tests, such as fMRI and MEG, can be used for localization of motor-sensory and language cortex.

## DISCLOSURE

None of the authors has any conflict of interest to disclose. We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

**Data S1.** Survey Questions: Is the Wada test always necessary?

**Data S2.** Controversy in epilepsy series on Wada and grid localization: written comments.