DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Resources and References for the DCoE June 2014 Traumatic Brain Injury Webinar

Why Does Concussion Affect Men Differently Than Women?

Resources

The DCoE "Indications and Conditions for Neuroendocrine Dysfunction Screening Post mTBI Recommendations," reference card and training slides assist primary care providers with identifying service members experiencing persistent symptoms following mild traumatic brain injury (TBI) who may benefit from endocrine evaluation and care. The article, "Neuroendocrine dysfunction following mild TBI: When to screen for it" will also enhance your knowledge on this topic.

References

Agha, A., Rogers, B., Mylotte, D., Taleb, F., Tormey, W., Phillips, J., & Thompson, C.J. (2004). Neuroendocrine dysfunction in the acute phase of traumatic brain injury. *Clinical Endocrinology (Oxford), 60*(5), 584-591.

Amara, J., Iverson, K. M., Krengel, M., Pogoda, T. K., & Hendricks, A. (2014). Anticipating the traumatic brain injury-related health care needs of women veterans after the Department of Defense change in combat assignment policy. *Women's Health Issues, 24*, e171-176.

Asbury, E. T., Fritts, M. E., Horton, J. E., & Isaac, W. L. (1998). Progesterone facilitates the acquisition of avoidance learning and protects against subcortical neuronal death following prefrontal cortex ablation in the rat. *Behavioral Brain Research, 97*, 99-106.

Avesani, R., Carraro, E., Armani, G., & Masiero, S. (2012). Exploring variables associated with rehabilitation length of stay in brain injuries patients. *European Journal of Physical Rehabilitation Medicine, 48*, 433-441.

Barcelo, F., & Santome-Calleja, A. (2000). A critical review of the specificity of the Wisconsin card sorting test for the assessment of prefrontal function. *Review of Neurology, 30*, 855-864.

Barr, W. B. (2003). Neuropsychological testing of high school athletes. Preliminary norms and test-retest indices. *Archives of Clinical Neuropsychology, 18*, 91-101.

Bengtson, M., Martin, R., Sawrie, S., Gilliam, F., Faught, E., Morawetz, R., & Kuzniecky, R. (2000). Gender, memory, and hippocampal volumes: Relationships in temporal lobe epilepsy. *Epilepsy Behavior, 1*, 112-119.

Berry, C., Ley, E. J., Tillou, A., Cryer, G., Margulies, D. R., & Salim, A. (2009). The effect of gender on patients with moderate to severe head injuries. *Journal of Trauma, 67*, 950-953.

Bogdanova, Y., & Verfaellie, M. (2012). Cognitive sequelae of blast-induced traumatic brain injury: Recovery and rehabilitation. *Neuropsychology Review, 22*, 4-20.

Bounds, T. A., Schopp, L., Johnstone, B., Unger, C., & Goldman, H. (2003). Gender differences in a sample of vocational rehabilitation clients with TBI. *NeuroRehabilitation, 18*, 189-196.

Colantonio, A., Mar, W., Escobar, M., Yoshida, K., Velikonja, D., Rizoli, S., . . . Cullen, N. (2010). Women's health outcomes after traumatic brain injury. *Journal of Women's Health (Larchmont), 19*, 1109-1116.

Corrigan, J. D., Selassie, A. W., Lineberry, L. A., Millis, S. R., Wood, K. D., Pickelsimer, E. E., & Rosenthal, M. (2007). Comparison of the Traumatic Brain Injury (TBI) Model Systems national dataset to a population-based cohort of TBI hospitalizations. *Archives of Physical Medicine and Rehabilitation, 88*, 418-426.

Crockett, D., Bilsker, D., Hurwitz, T., & Kozak, J. (1986). Clinical utility of three measures of frontal lobe dysfunction in neuropsychiatric samples. *International Journal of Neuroscience, 30*, 241-248.

Cutler, S. M., Cekic, M., Miller, D. M., Wali, B., VanLandingham, J. W., & Stein, D. G. (2007). Progesterone improves acute recovery after traumatic brain injury in the aged rat. *Journal of Neurotrauma, 24*, 1475-1486.

Davis, D. P., Douglas, D. J., Smith, W., Sise, M. J., Vilke, G. M., Holbrook, T. L., . . . Hoyt, D. B. (2006). Traumatic brain injury outcomes in pre- and post-menopausal females versus age-matched males. *Journal of Neurotrauma, 23*, 140-148.

Denckla, M. B. (1994). Measurement of executive function. In G. R. Lyon (Ed.), *Frames of reference for the assessment of learning disabilities: New views on measurement issues* (pp. 117-142). Baltimore, MD: Paul H. Brooks.

Djebaili, M., Hoffman, S. W., & Stein, D. G. (2004). Allopregnanolone and progesterone decrease cell death and cognitive deficits after a contusion of the rat pre-frontal cortex. *Neuroscience, 123*, 349-359.

Doninger, N. A., Heinemann, A. W., Bode, R. K., Sokol, K., Corrigan, J. D., & Moore, D. (2003). Predicting community integration following traumatic brain injury with health and cognitive status measures. *Rehabilitation Psychology, 48*, 67-76.

Farace, E., & Alves, W. M. (2000). Do women fare worse? A metaanalysis of gender differences in outcome after traumatic brain injury. *Neurosurgery Focus, 8*, e6.

Gansler, D. A., Covall, S., McGrath, N., & Oscar-Berman, M. (1996). Measures of prefrontal dysfunction after closed head injury. *Brain and Cognition, 30*, 194-204.

Garringer, J.A., Niyonkuru, C., McCullough, E.H., Loucks, T., Dixon, C.E., Conley, . . . Wagner, A.K. (2013). Impact of aromatase genetic variation on hormone levels and global outcome after severe TBI. *Journal of Neurotrauma*, *(30)*16, 1415-1425.

Geraldina, P., Mariarosaria, L., Annarita, A., Susanna, G., Michela, S., Alessandro, D., . . . Enrico, C. (2003). Neuropsychiatric sequelae in TBI: A comparison across different age groups. *Brain Injury, 17*, 835-846.

Gerhart, K. A., Mellick, D. C., & Weintraub, A. H. (2003). Violence-related traumatic brain injury: A population-based study. *Journal of Trauma, 55*, 1045-1053.

Goranson, T. E., Graves, R. E., Allison, D., & La Freniere, R. (2003). Community integration following multidisciplinary rehabilitation for traumatic brain injury. *Brain Injury, 17*, 759-774.

Grant, D. A., & Berg, E. A. (1948). A behavioral analysis of degree of reinforcement and ease of shifting to new

responses in a Weigl-type card-sorting problem. *Journal of Experimental Psychology, 38*, 404-411.

Groswasser, Z., Cohen, M., & Keren, O. (1998). Female TBI patients recover better than males. *Brain Injury,12*, 805-808.

Heaton, R. K., Chelune, G. J., Talley, J. L., Kay, G. G., & Curtiss, G. (1993). *Wisconsin Card Sorting Test Manual: Revised and expanded.* Odessa, FL: Psychological Assessment Resources Inc.

Jensen, O. K., & Thulstrup, A. M. (2001). Gender differences of post-traumatic headache and other post-commotio symptoms. A follow-up study after a period of 9-12 months. *Ugeskr Laeger, 163*, 5029-5033.

Jeter, C. B., Hergenroeder, G. W., Hylin, M. J., Redell, J. B., Moore, A. N., & Dash, P. K. (2013). Biomarkers for the diagnosis and prognosis of mild traumatic brain injury/concussion. *Journal of Neurotrauma, 30*, 657-670.

Kadyan, V., Mysiw, W. J., Bogner, J. A., Corrigan, J. D., Fugate, L. P., & Clinchot, D. M. (2004). Gender differences in agitation after traumatic brain injury. *American Journal of Physical Medicine and Rehabilitation, 83*, 747-752.

Kraus, J. F., Peek-Asa, C., & McArthur, D. (2000). The independent effect of gender on outcomes following traumatic brain injury: A preliminary investigation. *Neurosurgical Focus, 8*, e5.

Leitgeb, J., Mauritz, W., Brazinova, A., Janciak, I., Majdan, M., Wilbacher, I., & Rusnak, M. (2011). Effects of gender on outcomes after traumatic brain injury. *Journal of Trauma, 71*, 1620-1626.

Leitgeb, J., Mauritz, W., Brazinova, A., Matula, C., Majdan, M., Wilbacher, I., & Rusnak, M. (2012). Outcome of patients with severe brain trauma who were treated either by neurosurgeons or by trauma surgeons. *Journal of Trauma Acute Care Surgery, 72*, 1263-1270.

Ley, E. J., Short, S. S., Liou, D. Z., Singer, M. B., Mirocha, J., Melo, N., . . . Salim, A. (2013). Gender impacts mortality after traumatic brain injury in teenagers. *Journal of Trauma Acute Care Surgery, 75*, 682-686.

Lezak, M. (2004). *Neuropsychological Assessment* (4th ed.). New York, NY: Oxford.

Liossi, C., & Wood, R. L. (2009). Gender as a moderator of cognitive and affective outcome after traumatic brain injury. *Journal of Neuropsychiatry Clinical Neuroscience, 21*, 43-51.

McCauley, S. R., Boake, C., Levin, H. S., Contant, C. F., & Song, J. X. (2001). Postconcussional disorder following mild to moderate traumatic brain injury: Anxiety, depression, and social support as risk factors and comorbidities. *Journal of Clinical Experimental Neuropsychology, 23*, 792-808.

McMordie, W. R., Barker, S. L., & Paolo, T. M. (1990). Return to work (RTW) after head injury. *Brain Injury, 4*, 57-69.

Moore, D. W., Ashman, T. A., Cantor, J. B., Krinick, R. J., & Spielman, L. A. (2010). Does gender influence cognitive outcome after traumatic brain injury? *Neuropsychological Rehabilitation, 20*, 340-354.

Niemeier, J. P., Marwitz, J. H., Lesher, K., Walker, W. C., & Bushnik, T. (2007). Gender differences in executive functions following traumatic brain injury. *Neuropsychological Rehabilitation, 17*, 293-313.

Niemeier, J. P., Marwitz, J. H., Walker, W. C., Davis, L. C., Bushnik, T., Ripley, D. L., & Ketchum, J. M. (2013). Are there cognitive and neurobehavioural correlates of hormonal neuroprotection for women after TBI? *Neuropsychological Rehabilitation, 23*, 363-382.

Parks, J. K., Diaz-Arrastia, R., Gentilello, L. M., & Shafi, S. (2010). Postinjury employment as a surrogate for functional outcomes: A quality indicator for trauma systems. *Proceedings (Baylor University Medical Center), 23*(4), 355-358.

Perecman, E. (1987). *The frontal lobes revisited* (E. Perecman Ed.). New York, NY: IRBN Press.

Pettit, L. D., Bastin, M. E., Smith, C., Bak, T. H., Gillingwater, T. H., & Abrahams, S. (2013). Executive deficits, not processing speed relates to abnormalities in distinct prefrontal tracts in amyotrophic lateral sclerosis. *Brain, 136*, 3290-3304.

Pettus, E. H., Wright, D. W., Stein, D. G., & Hoffman, S. W. (2005). Progesterone treatment inhibits the inflammatory agents that accompany traumatic brain injury. *Brain Research, 1049*, 112-119.

Ponsford, J. L., Myles, P. S., Cooper, D. J., McDermott, F. T., Murray, L. J., Laidlaw, J., . . . Bernard, S. A. (2008). Gender differences in outcome in patients with hypotension and severe traumatic brain injury. *Brain Injury, 39*, 67-76.

Prigatano, G. P., Borgaro, S., Baker, J., & Wethe, J. (2005). Awareness and distress after traumatic brain injury: A relative's perspective. *Journal of Head Trauma Rehabilitation, 20*, 359-367.

Putukian, M., Echemendia, R. J., & Mackin, S. (2000). The acute neuropsychological effects of heading in soccer: A pilot study. *Clinical Journal of Sport Medicine, 10*, 104-109.

Ratcliff, J. J., Greenspan, A. I., Goldstein, F.C., Stringer, A.Y., Bushnik, T., Hammond, F. M., . . . Wright, D.W. (2007). Gender and traumatic brain injury: Do the sexes fare differently? *Brain Injury*, *21*, 1023-1030.

Ripley, D.L., Harrison-Felix, C., Sendroy-Terrill, M., Cusick, C.P., Dannels-McClure, A., & Morey, C. (2008). The impact of female reproductive function on outcomes after traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, *89*(6), 1090-1096.

Roberts, I., Yates, D., Sandercock, P., Farrell, B., Wasserberg, J., Lomas, G., . . . Edwards, P. (2004). Effect of intravenous corticosteroids on death within 14 days in 10,008 adults with clinically significant head injury. (MRC CRASH trial): Randomised placebo-controlled trial. *Lancet, 364*, 1321-1328.

Santarsieri, M., Niyonkuru, C., McCullough, E.H., Loucks, T., Dobos, J., Dixon, . . . Wagner, A.K. (2014). Cerebrospinal fluid cortisol and progesterone profiles and outcomes after severe traumatic brain injury. *Journal of Neurotrauma, 31*(8), 699-712.

Schopp, L., Shigaki, C., Johnstone, B., & Kirkpatrick, H. (2001). Gender differences in cognitive and emotional adjustment to traumatic brain injury. *Journal of Clinical Psychology in Medical Settings, 8*, 181-188.

Slewa-Younan, S., Baguley, I. J., Heriseanu, R., Cameron, I. D., Pitsiavas, V., Mudaliar, Y., & Nayyar, V. (2008). Do men and women differ in their course following traumatic brain injury? A preliminary prospective investigation of early outcome. *Brain Injury, 22*, 183-191.

Soules, M. R. (2005). Development of a staging system for the menopause transition: A work in progress. *Menopause, 12*, 117-120.

Soules, M. R., Sherman, S., Parrott, E., Rebar, R., Santoro, N., Utian, W., & Woods, N. (2001). Executive summary: Stages of Reproductive Aging Workshop (STRAW) Park City, Utah, July, 2001. *Menopause, 8*, 402-407.

Steadman-Pare, D., Colantonio, A., Ratcliff, G., Chase, S., & Vernich, L. (2001). Factors associated with perceived quality of life many years after traumatic brain injury. *Journal of Head Trauma Rehabilitation, 16*, 330-342.

Stein, D. G., Wright, D. W., & Kellermann, A. L. (2008). Does progesterone have neuroprotective properties? *Annals of Emergency Medicine, 51*, 164-172.

U.S. National Institutes of Health (2014). *Resuscitative endocrinology: Single-dose clinical uses for estrogen – traumatic brain injury (RESCUE – TBI).* Retrieved May 20, 2014, from http://clinicaltrials.gov/show/NCT00973674

Van der Naalt, J., van Zomeren, A. H., Sluiter, W. J., & Minderhoud, J. M. (2000). Acute behavioural disturbances related to imaging studies and outcome in mild-to-moderate head injury. *Brain Injury, 14*, 781-788.

Wagner, A. K. (2004). *Gender and neurosteroids in pathogenesis, treatment, and recovery after TBI.* Paper presented at the 65th Annual American Academy of Physical Medicine and Rehabilitation Conference, Phoenix, AZ.

Wagner, A.K., Brett, C.A., McCullough, E.H., Niyonkuru, C., Loucks, T., Dixon, C.E., . . . Berga, S.L. (2012). Persistent hypogonadism influences estradiol synthesis, cognition and outcome in males after severe TBI. *Brain Injury, 26*(10), 1226-1242.

Wagner, A.K., McCullough, E.H., Niyonkuru, C., Ozawa, H., Loucks, T., Dobos, J.A., . . . Fabio, A. (2011). Acute serum hormone levels: Characterization and prognosis after severe traumatic brain injury. *Journal of Neurotrauma*, *28*(6), 871-888.

Weigl, E. (1941). On the psychology of so-called processes of abstraction. *The Journal of Abnormal and Social Psychology, 36*, 3-33.

Wilkinson, C.W., Pagulayan, K.F., Petrie, E.C., Mayer, C.L., Colasurdo, E.A., Shofer, J.B., . . . Peskind, E.R. (2012). High prevalence of chronic pituitary and target-organ hormone abnormalities after blast-related mild traumatic brain injury. *Frontiers in Neurology, (3)*11.

Wright, D.W., Kellermann, A.L., Hertzberg, V.S., Clark, P.L., Frankel, M., Goldstein, F.C., . . . Stein, D.G. (2007). ProTECT: A randomized clinical trial of progesterone for acute traumatic brain injury. *Annals of Emergency Medicine, 49*, 391-402.

Wunderle, K., Hoeger, K. M., Wasserman, E., & Bazarian, J. J. (2013). Menstrual phase as predictor of outcome after mild traumatic brain injury in women. *Journal of Head Trauma Rehabilitation.* Advance online publication. doi: 10.1097/HTR.0000000000000006

Xiao, G., Wei, J., Yan, W., Wang, W., & Lu, Z. (2008). Improved outcomes from the administration of progesterone for patients with acute severe traumatic brain injury: a randomized controlled trial. *Critical Care, 12*, R61.

Yeung, J. H., Mikocka-Walus, A. A., Cameron, P. A., Poon, W. S., Ho, H. F., Chang, A., . . . Rainer, T. H. (2011). Protection from traumatic brain injury in hormonally active women vs men of a similar age: A retrospective international study. *Archives of Surgery, 146*, 436-442.