Rapid Eye Movement Sleep and General Anesthesia

To the Editor:
I read with great interest the article by Leslie et al.,
discribing the electroencephalographic correlates of dreaming
during anesthesia. Their conclusion that traits of rapid eye
movement (REM) sleep are expressed during emergence from an-
esthesia is provocative. It is of historical interest to note that
a common mechanism of dreaming during both sleep and
anesthesia was predicted by the psychoanalyst Paul Federn,
after the self-analysis of a dream that he experienced under
nitrous oxide. Federn discussed this in a 1943 lecture to the
American Psychoanalytic Association—one decade before
the discovery of REM sleep by Aserinsky and Kleitman—
and, in a later publication, concluded that “one can expect to
find the basic mechanisms in dream-production during gen-
eral anesthesia will not differ from those in dream-production
during physiologic sleep.”

More modern concepts of relevance to the work by Leslie et al. include “covert REM” and REM sleep as a form of
“protoconsciousness.” Nielsen et al. suggested that isolated REM
sleep traits could be expressed during non-REM sleep,
thereby accounting for dreaming and mentation during this
stage. Therefore, the covert REM hypothesis is consistent with the “simple” anesthesia-related dreams that Leslie et al.
describe, which are more characteristic of non-REM dreams
despite the electroencephalographic REM-like traits. The
framework of covert REM during emergence from anesthesia
fits well with the observed data distinguishing the anesthetic
dreamer and nondreamer and avoids the need to account for
every component of classic REM sleep (e.g., muscle atonia).

Also of relevance is the suggestion that REM sleep repre-
sents a form of protoconsciousness, a view derived, in part,
from the observation that REM sleep occurs during gesta-
tion. The “ontogenetic hypothesis” put forth by Roffwarg et al. in 1966 suggests that the endogenous process of cortical
activation associated with REM sleep prepares the fetus or
developing animal for sensory experience. It is of interest to
consider whether REM sleep-like traits are a similar form of
protoconsciousness that may precede the planned or un-
planned emergence from general anesthesia.

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In Reply:
We thank Dr. Mashour for his interest in our article. It is
difficult to avoid getting entangled in semantic issues in this type
of research. As Dr. Mashour has indicated, the problem with
traditional heuristic definitions of sleep stage is that they are
arbitrarily defined and lack a proper causal linkage with sleep
functions. Thus, we are in favor of Dr. Mashour’s term “pro-
toconsciousness” to describe states of mentation associated
with activation (depolarization) of the cerebral cortex, but
which fall short of wakeful responsiveness to the external
world. These states are usually indicated by the increased
electroencephalographic and bispectral index values and are
common during general anesthesia.

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Early Labor Neuraxial Analgesia: Effects on the Progress and Outcome of Labor

To the Editor:
We congratulate Wang et al. for their single-institution,
randomized controlled trial of 12,793 parturients. The
investigators confirmed that nulliparas who receive neuraxial
labour analgesia in early labor (defined in this study as cervical
dilation ≥ 1 cm and < 4 cm) are not at greater risk for
cesarean delivery or prolonged labor compared with nulliparas who wait until cervical dilation is more than or equal to
4 cm for initiation of neuraxial analgesia. These results are in

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tained with propofol or desflurane. ANESTHESIOLOGY 2009; 111:547–55


We would like to clarify one point. The authors state in the introduction that “current best available evidence in nulliparous women... supports that epidural analgesia is safe in laboring women with cervix dilated 2 cm or more” and cite our study2 and that of Ohel et al.4 to support this statement. In addition, they suggest that current data do not address the effects of neuraxial analgesia when cervical dilation is less than 2 cm. This statement is not correct. Both our studies2,3 and the study by Ohel et al.4 randomized women in early labor (cervical dilation < 4 cm) to neuraxial versus systemic opioid analgesia at the first request for pain relief, no matter the cervical dilation. Indeed, the median cervical dilation at initiation of analgesia was 2 cm in our studies2,3 and the mean dilation was 2.1 cm in the study by Ohel et al., meaning that 50% of the study populations had cervical dilation 2 cm or less at the initiation of analgesia. Therefore, we disagree with Wang et al. that data do not exist to support the practice of initiating neuraxial labor analgesia when cervical dilation is less than 2 cm.

We are also concerned about the reporting and interpretation of the data regarding one of the secondary outcomes, duration of labor.1 The duration of labor and duration of neuraxial analgesia in the study by Wang et al. are significantly longer (hours) than that in our studies of spontaneous2 and induced3 labors, and in the study by Ohel et al.4 with a mixed parity population. In table 2, the outcome of interest is listed as “Length of labor (from analgesia request to vaginal delivery), h§.” However, in the footnote to the table, the symbol “§” is defined as the length of time from labor starting from the onset of regular uterine contractions to the time of delivery of the placenta. The text describing the results of the Kaplan–Meier duration of labor analysis indicates that duration was defined as the interval from analgesia request to delivery. However, it is unclear why the median duration of epidural analgesia is 12.6 h in the early (latent phase) neuraxial analgesia group (table 2); but, the median duration of labor from analgesia request is 627 min (10.5 h; fig. 2A).

In our studies, we defined duration of labor as the time from analgesia request until delivery (~7 h),2 and Ohel et al.4 defined the duration of labor as the time of randomization until delivery (~6 h). This distinction is important for two reasons. First, the timing of the first regular contraction is hard to specify, and we suggest that pinpointing this time is subject to considerable bias. Second, both we2,3 and Ohel et al.4 found that the duration of labor was significantly shorter in women randomly assigned to early neuraxial compared with early systemic opioid analgesia, whereas Wang et al. did not. We suggest that the investigators cannot ascertain the effect of early labor analgesia on duration of labor by using the time of onset of regular contractions as the start time of labor. The ill-defined and likely highly variable interval between onset of regular contractions and the actual therapeutic intervention (initiation of analgesia) may obscure any differences that may have occurred because of the intervention. To ascertain the effect of an intervention on the duration of labor, the start time must be close to the time of the intervention. Therefore, if duration of labor was defined as the interval between the onset of regular contractions and delivery, Wang et al. cannot make valid conclusions about the effect of early neuraxial analgesia on the progress of labor. If the investigators defined the start time of labor as the time of request of analgesia, then there must be significant differences in labor progress between the American2,3 and Israeli4 populations of the previous studies and the current Chinese population,1 in that labor was significantly longer in the Chinese population.

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References


In Reply:

We appreciate the interest of Drs. Wong, Scavone, Sullivan, and McCarthy in our work1 and thank them for their comments. The association between neuraxial analgesia at different stages of cervical dilation and the risk of cesarean delivery is an important issue and has been debated for decades. We performed a 5-yr randomized controlled trial, initiated in January 2003, to investigate the hypothesis that early epidural analgesia at cervical dilation of 1.0 cm or more would not increase the risk of cesarean delivery or prolonged labor, and found results that were consistent with those reported by Wong et al.2,3 and Ohel et al.4

In our study, the median diameter of cervical dilation was 1.6 cm (interquartile range, 1.1–2.8 cm) in the early epidural analgesia, which was smaller than that reported by Wong et al. (median, 2.0 cm) or Ohel et al. (mean, 2.1 cm). In our publication, we described published data regarding neuraxial analgesia at a cervical dilation of 2.0 cm and which provide

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