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Can hypertonic osmotic diuretics be used in pregnancy?

Multiple neuropathologic processes can occur in the parturient. These can be pre-existing and unrelated to pregnancy (epilepsy, hemorrhage, trauma, tumors) or secondary to pathologic processes associated with pregnancy (pre-eclampsia, eclampsia, HELLP). Increased intracranial pressure can be a manifestation of these conditions, where the administration of hypertonic osmotic diuretics is part of standard treatment protocols in the non-pregnant patient.

There are no human studies regarding the safety of hypertonic osmotic diuretics (specifically hypertonic saline and mannitol) in pregnancy. Therefore the basis of the current recommendations is largely theoretical and based upon animal models (6).

Mannitol, in contrast to hypertonic saline, crosses the placenta (5). It has been shown to slowly accumulate in the fetus and is excreted in fetal urine. Fetal hyperosmolarity secondary to mannitol administration has been associated with negative consequences such as reduced fetal lung fluid production, reduced renal blood flow, and increased fetal plasma sodium concentration. There is also a theoretical concern of fetal dehydration based on animal models. Despite this, there are case reports of mannitol being administered in low doses (0.25-0.5g/kg) in pregnant patients without negative fetal consequences (4). One interesting case report in particular describes the use of mannitol 0.25g/kg in a pregnant patient for an awake craniotomy. In this case, reduction in uterine volume was observed on serial measurements, though no adverse fetal effect was identified (3).

As mentioned above, hypertonic saline does not cross the placenta. However, like mannitol, its use has not been studied specifically in the pregnant population. As such its use should be reserved for emergency situations where urgent brain relaxation is required (1). Hypertonic saline also has a potentially negative connotation during pregnancy as it has been used historically as an abortive agent in the first trimester. However, this was with direct injection of hypertonic saline into the uterus and does not correlate with intravenous administration (6). At least one review did favor the use of hypertonic saline over mannitol as it was thought to be more “physiological,” though the exact basis for this is unclear (6).

Overall, the use of hypertonic solutions during pregnancy should be reserved for situations where brain relaxation is absolutely necessary (bridge to decompressive therapy, active herniation, etc.) (2). Like many medications and therapies hypertonic fluid use has not been studied in pregnant patients and the existing animal data suggests that there could be deleterious effects on a developing fetus, particularly at high doses. In regards to what agent to choose, there is a paucity of data guiding the decision between mannitol and hypertonic saline. Ultimately, in a situation where brain relaxation is urgently required, the risk of administering hypertonic solutions must be weighed against the risk of raised maternal ICP, which can have deleterious effects on the mother and subsequently on the fetus.

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