



Osmotic Demyelination Syndrome (ODS)

Neuroanesthesia Quiz #84



Quiz Team

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QUESTION 1

Which of the following statement is *true* about ODS ?

Please click on any of the following links to proceed to that question/topic.

[A: Serum sodium level of <130mmol/L is usually associated with ODS](#)

[B: ODS can result if the rate of sodium correction is <0.5mmol/l per hour](#)

[C: Rapid correction of serum sodium level in a patient with hyponatremia of ≤12 hrs duration can cause ODS](#)

[D: ODS can occur in hypernatremic state](#)

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[Q2, Q3, Q4, Q5](#)

Sorry! Incorrect.

EXPLANATION

A. Serum sodium level of $<130\text{mmol/L}$ is usually associated with ODS

This statement is incorrect!!!

ODS primarily occurs with rapid correction of severe hyponatremia and the most susceptible patients are with serum sodium levels of $<120\text{mmol/L}$

Danyalian A, Heller D. Central Pontine Myelinolysis. [Updated 2022 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK551697/>

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Sorry! Incorrect.

EXPLANATION

B. ODS can result if the rate of sodium correction is $<0.5\text{mmol/l}$ per hour

This statement is incorrect!!

Rate of hyponatremia correction is an important factor governing the development of ODS. The ODS occurs most commonly with rapid sodium correction of $>0.5\text{-}1.0\text{ mmol/L}$ per hour.

Danyalian A, Heller D. Central Pontine Myelinolysis. [Updated 2022 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): Stat Pearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK551697/>

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Sorry! Incorrect.

EXPLANATION

C. Rapid correction of serum sodium level in a patient with hyponatremia of ≤ 12 hrs duration can cause ODS

This statement is incorrect!!

One of the important aspect of development of ODS is rapid correction of hyponatremia in patients with history of chronic hyponatremia. The ODS primarily occurs with rapid correction of severe hyponatremia of more than two to three days (i.e 48 to 72hours) duration. Duration of hyponatremia is an important determinant for ODS as rapid correction is not likely to induce ODS in patients with severe hyponatremia that has only been present for few hours.

Verbalis JG, Goldsmith SR, Greenberg A, et al. Diagnosis, evaluation, and treatment of hyponatremia: expert panel recommendations. Am J Med 2013; 126:S1.

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Great Job!! Correct.

EXPLANATION

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D. ODS can occur in hypernatremia state

This statement is correct !!

ODS rarely occurs in severe hypernatremic state. The mechanism of ODS in hypernatremia is poorly understood. Rapid correction of hypernatremia and rapid change from normal serum sodium levels to marked hypernatremia may cause myelinolysis in humans. In cases of ODS seen in hypernatremic states, extrapontine lesions are seen more often than central pontine ones.

S. Varanda, S. Costa, R. Carvalho, F. Sousa, and G. Carneiro. "Central pontine myelinolysis caused by hypernatremia," Journal of the Neurological Sciences, vol. 370, pp. 274–276, 2016.

Ismail FY, Szollics A, Szollics M, Nagelkerke N, Ljubisavljevic M. Clinical semiology and neuroradiologic correlates of acute hypernatremic osmotic challenge in adults: a literature review. AJNR Am. J. Neuroradiol. 2013; 34: 2225-2232

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QUESTION 2

All of the following are known to be associated with ODS *except*

Please click on any of the following links to proceed to that question/topic.

[A: Liver transplantation](#)

[B: Alcoholism](#)

[C: Hypoglycemic state](#)

[D: Severe burn](#)

[Content Outline](#)

[Q1, Q3, Q4, Q5](#)

Sorry! Incorrect.

EXPLANATION

A. Liver transplantation

This statement is correct !!

Osmotic Demyelination syndrome has been shown to have an increased incidence in patients after orthotopic liver transplantation, with most cases seen within ten days of transplant.

Yun BC, Kim WR, Benson JT, et al. Impact of pretransplant hyponatremia on outcome following liver transplantation. *Hepatology* 2009; 49:1610.

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Sorry! Incorrect.

EXPLANATION

B. Alcoholism

[This statement is correct!!](#)

Chronic alcoholism and malnutrition are known risk factors for development of ODS.

Sterns RH. Osmotic demyelination syndrome (ODS) and overly rapid correction of hyponatremia . In: UpToDate, Post, Emmett M (Ed), UpToDate, Waltham, MA, 2022

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Great Job!! Correct.

EXPLANATION

C. Hypoglycemic state

This statement is incorrect !!

Osmotic demyelination syndrome is a rare but severe complication of a hyperosmolar hyperglycemic state. Physicians should be aware not only of changes in serum sodium, but also of changes in serum osmolality and serum glucose.

Guerrero WR, Dababneh H, Nadeau SE. Hemiparesis, encephalopathy, and extrapontine osmotic myelinolysis in the setting of hyperosmolar hyperglycemia. J Clin Neurosci 2013; 20(6):894–96.

Takanobu Hirosawa, Taro Shimizu. Osmotic demyelination syndrome due to hyperosmolar hyperglycemia. Cleveland Clinic Journal of Medicine July 2018, 85 (7) 511-513

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Sorry! Incorrect.

EXPLANATION

D. Severe burn

This statement is correct !!

Burn is associated with ODS. Severely burned patients are especially susceptible to ODS.

Martin RJ. Central pontine and extrapontine myelinolysis: the osmotic demyelination syndromes. *J Neurol Neurosurg Psychiatry*. 2004 Sep;75 Suppl 3(Suppl 3):iii 22-8.

Corona, G, Simonetti, L., Giuliani, C. et al. A case of osmotic demyelination syndrome occurred after the correction of severe hyponatraemia in hyperemesis gravidarum. *BMC Endocr Disord* 14, 34 (2014).

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QUESTION 3

All of the following statements are true about pathogenesis of ODS *except*

Please click on any of the following links to proceed to that question/topic.

[A:Central pontine myelinolysis \(CPM\) is synonymous with Osmotic demyelination syndrome \(ODS\)](#)

[B:The immediate response to blood hypotonicity is movement of brain interstitial fluid into CSF](#)

[C:Brain Astrocytes are the most affected cells in ODS](#)

[D: The brain lesion in central pontine myelinolysis \(CPM\) is symmetrical in location](#)

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[Q1, Q2, Q4, Q5](#)

Great Job!! Correct.

EXPLANATION

A. Central pontine myelinolysis (CPM) is synonymous with Osmotic Demyelination Syndrome (ODS)

This statement is incorrect !!

The neurologic manifestations associated with rapid correction of hyponatremia is called the osmotic demyelination syndrome (ODS). The syndrome includes 3 variations of myelinolysis: central pontine myelinolysis (CPM) alone, extrapontine myelinolysis (EPM) alone, and CPM and EPM together. Hence, CPM is not synonymous with ODS

Singh TD, Fugate JE, Rabinstein AA. Central pontine and extrapontine myelinolysis: a systematic review. Eur J Neurol 2014; 21(12):1443–1450

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Sorry! Incorrect.

EXPLANATION

B. The immediate response to blood hypotonicity is movement of brain interstitial fluid into CSF

This statement is correct !!

Brain adapts to hypotonicity immediately after hyponatremia in order to prevent cerebral edema and the resultant increased intra cranial pressure (ICP). After a fall in serum sodium, increased ICP forces interstitial sodium and water into the cerebrospinal fluid, ameliorating the increased brain volume. “Volume regulatory decrease’ is another mechanism that includes the removal of intracellular solutes and water via ion channels to reduce brain swelling and normalize brain volume.

Giuliani C, Peri A. Effects of Hyponatremia on the Brain. J Clin Med. 2014 Oct 28;3(4):1163-77

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Sorry! Incorrect.

EXPLANATION

C. Brain Astrocytes are the most affected cells in ODS

This statement is correct!!

Approximately 24 hours after the osmotic insult, astrocytes and oligodendrocytes begin to die in regions of the brain that are affected by demyelination and this may be accompanied by breakdown of the blood-brain barrier, release of inflammatory cytokines, and activation of microglia. Main cells affected in ODS are the astrocytes.

Gankam Kengne F, Nicaise C, Soupart A, et al. Astrocytes are an early target in osmotic demyelination syndrome. *J Am Soc Nephrol* 2011; 22:1834

Gankam-Kengne F, Couturier BS, Soupart A, et al. Osmotic Stress-Induced Defective Glial Proteostasis Contributes to Brain Demyelination after Hyponatremia Treatment. *J Am Soc Nephrol* 2017; 28:1802

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Sorry! Incorrect.

EXPLANATION

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D. The brain lesion in central pontine myelinolysis (CPM) is symmetrical in location

[This statement is correct!!](#)

CPM is a concentrated, often symmetric, noninflammatory demyelination within the central basis pontis. The typical radiologic feature of CPM is a trident-shaped, symmetric hyperintense lesion in the central pons with sparing of the periphery.

Han MJ, Kim DH, Kim YH, Yang IM, Park JH, Hong MK. A Case of Osmotic Demyelination Presenting with Severe Hyponatremia. *Electrolyte Blood Press.* 2015 Jun;13(1):30-6.

Haynes HR, Gallagher PJ, Cordaro A, Likeman M, Love S. A case of chronic asymptomatic central pontine myelinolysis with histological evidence of remyelination. *Forensic Sci Med Pathol.* 2018 Mar;14(1):106-108

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QUESTION 4

Which of the following statement is *true* about the clinical manifestations of ODS

Please click on any of the following links to proceed to that question/topic.

[A: Clinical manifestation starts immediately following rapid correction of chronic hyponatremia](#)

[B: Spastic quadriparesis is an early manifestation of CPM](#)

[C: The clinical course is biphasic in CPM](#)

[D: Choreoathetosis or dystonia can be a manifestation of CPM](#)

[Content Outline](#)

[Q1, Q2, Q3, Q5](#)

Sorry! Incorrect.

EXPLANATION

A. Clinical manifestation starts immediately following rapid correction of chronic hyponatremia

This statement is incorrect!!

Clinical manifestations of ODS are typically delayed for two to six days after rapid correction of the serum sodium. Manifestation is not immediate.

Sterns RH. Osmotic demyelination syndrome (ODS) and overly rapid correction of hyponatremia . In: UpToDate, Post, Emmett M (Ed), UpToDate, Waltham, MA, 2022

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Sorry! Incorrect.

EXPLANATION

B. Spastic quadriparesis is an early manifestation of CPM

This statement is incorrect!!

The initial signs of CPM include dysarthria and dysphagia (secondary to corticobulbar fibre involvement), a flaccid quadriparesis (from corticospinal tract involvement) which later becomes spastic.

Martin RJ; Central Pontine And Extrapontine Myelinolysis: The Osmotic Demyelination Syndromes. J Neurol Neurosurg Psychiatry 2004;75(Suppl 3):iii22–iii28

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Great Job!! Correct.

EXPLANATION

C. The Clinical course is biphasic in CPM

[This statement is correct!!](#)

Patients with CPM generally have a biphasic clinical course. Initially presents with encephalopathy or seizures, then recovering rapidly as normonatremia is restored. They deteriorate 3-5 days later and the presentation includes dysphagia, dysarthria, quadriparesis, pseudobulbar paralysis, ataxia, lethargy, tremors, dizziness, catatonia, and in the most severe cases, locked-in-syndrome and coma.

Martin RJ; Central Pontine And Extrapontine Myelinolysis: The Osmotic Demyelination Syndromes. J Neurol Neurosurg Psychiatry 2004;75(Suppl III):iii22–iii28

Sterns RH. Osmotic demyelination syndrome (ODS) and overly rapid correction of hyponatremia . In: UpToDate, Post, Emmett M (Ed), UpToDate, Waltham, MA, 2022

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Sorry! Incorrect.

EXPLANATION

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D. Choreoathetosis or dystonia can be a manifestation of CPM

This statement is incorrect!!

Extrapontine involvement in ODS i.e EPM can result in a variety of findings, including psychiatric disturbances, catatonia, postural limb tremor, myoclonic jerks, and a parkinsonian picture with choreoathetosis or dystonia.

Martin RJ; Central Pontine And Extrapontine Myelinolysis: The Osmotic Demyelination Syndromes. J Neurol Neurosurg Psychiatry 2004;75(Suppl III):iii22–iii28

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QUESTION 5

All of the following statements are true about management of ODS *except*

Please click on any of the following links to proceed to that question/topic.

[A: MRI is the radiological investigation of choice for diagnosis of ODS](#)

[B: Reintroduction of hyponatremia is one of the suggested methods for prevention of ODS](#)

[C: Initial clinical and radiological features have a definitive prognostic value in cases of ODS](#)

[D: Use of Thyrotrophin releasing hormone therapy has been reported to be effective in ODS](#)

[Content Outline](#)

[Q1, Q2, Q3, Q4](#)

Sorry! Incorrect.

EXPLANATION

A: MRI is the radiological investigation of choice for diagnosis of ODS.

This statement is correct !!

MRI has greater sensitivity for detection CPM than CT scan. It has superior capacity for the demonstration of the lesions of extra pontine myelinosis. Hence, it is the investigation of choice for diagnosis of ODS. Hyperintense lesions are seen on T2, and hypointense lesions on T1 weighted images. The lesions are non contrast enhancing. Lesion may not be evident in early period and a repeat imaging may be needed after 10-14days.

Brunner JE, Redmond JM, Haggar AM, et al. Central pontine myelinolysis and pontine lesions after rapid correction of hyponatremia: a prospective magnetic resonance imaging study. Ann Neurol 1990; 27:61.

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Sorry! Incorrect

EXPLANATION

B: Reintroduction of hyponatremia is one of the suggested methods for prevention of ODS

This statement is correct!!

5% dextrose in water (D5W) and desmopressin can be utilized with the goal of reintroducing hyponatremia to ensure that the rate of correction will be 8-12 mEq/L when the sodium correction has been too rapid.

Oya S, Tsutsumi K, Ueki K, et al. Reinduction of hyponatraemia to treat central pontine myelinolysis. *Neurology* 2001;57:1931–2.

Sterns RH, Hix JK, Silver SM. Management of hyponatremia in the ICU. *Chest*. 2013 Aug;144(2):672-679.

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Great Job!! Correct.

EXPLANATION

C: Initial clinical and radiological features can predict outcome in cases of ODS

This statement is incorrect !!

Neither clinical features nor extent of radiological change are predictive of outcome in ODS. The initial severity of the illness is not predictive of long-term prognosis in cases of ODS.

Martin RJ; Central Pontine And Extrapontine Myelinolysis: The Osmotic Demyelination Syndromes. J Neurol Neurosurg Psychiatry 2004;75(Suppl III):iii22–iii28.

Louis G, Megarbane B, Lavoué S, Lassalle V, Argaud L, Poussel JF, Georges H, Bollaert PE. Long-term outcome of patients hospitalized in intensive care units with central or extrapontine myelinolysis. Crit Care Med. 2012 Mar;40(3):970-2

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Sorry! Incorrect.

EXPLANATION

D: Use of Thyrotrophin releasing hormone therapy has been reported to be effective in ODS

This statement is correct !!

Treatments including steroids, intravenous immunoglobulin, and thyrotrophin releasing hormone have all shown good outcomes in CPM /EPM.

Martin RJ; Central Pontine And Extrapontine Myelinolysis: The Osmotic Demyelination Syndromes. J Neurol Neurosurg Psychiatry 2004;75(Suppl III):iii22–iii28.

Chemaly R, Halaby G, Mohasseb G, Medlej R, Tamraz J, el-Koussa S. Myélinolyse extra-pontine: traitement par T.R.H [Extrapontine myelinolysis: treatment with TRH]. Rev Neurol (Paris). 1998 ;154(2):163-5.

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THAT'S ALL.. THANK YOU !!

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