

Review began 08/31/2021  
Review ended 10/06/2021  
Published 10/06/2021

© Copyright 2021

Tan et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

# Myoclonus From Intoxication by Bismuth Iodoform Paraffin Paste (BIPP) Nasopharyngeal Packing

Rong Tan<sup>1</sup>, Shermyn Neo<sup>2</sup>, Jereme Gan<sup>1</sup>, Ernest Fu<sup>1</sup>, Ming Yann Lim<sup>1</sup>, Hao Li<sup>1</sup>

1. Department of Otorhinolaryngology, Tan Tock Seng Hospital, Singapore, SGP 2. Department of Neurology, National Neuroscience Institute, Singapore, SGP

Corresponding author: Hao Li, brendenlihao@gmail.com

---

---

## Abstract

Bismuth iodoform paraffin paste (BIPP) gauze is widely used as an antiseptic wound packing in otolaryngology, head, and neck surgery. Uncommonly, BIPP can cause intoxication. Our report highlights an elderly patient who developed encephalopathy and overt myoclonus after nasopharyngectomy secondary to intoxication by the components of the BIPP gauze. The patient's impaired renal function, the amount of BIPP packing and the extensive nature of his wound likely predisposed him to BIPP toxicity. The myoclonus and delirium resolved promptly after removal of the BIPP packs. Clinicians should be aware of the clinical features of BIPP intoxication because of its common usage.

---

**Categories:** Neurology, Otolaryngology, General Surgery

**Keywords:** bipp, bismuth, iodoform, iodine, wound packing, nasopharyngectomy, myoclonus, toxicity, encephalopathy, video

## Introduction

Bismuth iodoform paraffin paste (BIPP) gauze is an antiseptic dressing [1] routinely used in maxillectomy, nasopharyngectomy, and the management of epistaxis [2]. However, it should be remembered that BIPP can cause toxicity. Our report aims to highlight the risks of BIPP intoxication by discussing a patient with BIPP encephalopathy manifesting as overt myoclonus, recorded on videography.

## Case Presentation

In May 2016, a 74-year-old ethnically Chinese man with comorbidities of renal impairment (baseline serum creatinine 151-205  $\mu\text{mol/L}$ , creatinine clearance ~28-38 mL/min), hypertension, hyperlipidemia, diabetes mellitus, ischemic heart disease, and a previous left basal ganglia hemorrhage, underwent endoscopic nasopharyngectomy for recurrent nasopharyngeal carcinoma (NPC). He had been diagnosed with Stage III (T3N0M0, American Joint Committee on Cancer 7th Edition) NPC and completed chemoradiotherapy in 2014. In 2016, he was found to have a T1N0M0 recurrence in the left fossa of Rosenmüller of the nasopharynx. Endoscopic nasopharyngectomy with curative intent was performed in May 2016. This entailed a posterior septectomy, left inferior turbinectomy, mega maxillary antrostomy, and the drilling of the medial pterygoid plate followed by the resection of the cartilaginous left Eustachian tube en-bloc with the tumor in the left fossa of Rosenmüller. The resection cavity was reconstructed with a right-sided nasoseptal flap. The nasal cavity and nasopharynx were packed with five slips of BIPP gauze (impregnated with 20% bismuth subnitrate, 40% iodoform, and 40% liquid paraffin, Aurum Pharmaceuticals Ltd, Romford, United Kingdom). The resection margins were clear on the formalin-fixed paraffin-embedded specimens.

On postoperative day (POD) 6, the patient's mental state began to fluctuate between agitation and drowsiness. He exhibited labile emotions and developed negative myoclonus in the form of asterixis in his upper limbs (see Video 1). There was no evidence of bleeding, sepsis, or airway obstruction. A review of his medications showed that he only required tramadol 50mg once a day on average for analgesia from POD1 to POD6. Further investigation of his delirium showed raised liver enzymes, predominantly affecting aspartate aminotransferase (183 U/L) and alanine aminotransferase (264 U/L) but also affecting gamma-glutamyl transferase (180 U/L) and alkaline phosphatase (139 U/L), with normal bilirubin levels (13  $\mu\text{mol/L}$ ). Sonography of the hepatobiliary system revealed no evidence of cirrhosis or liver metastasis. Lumbar puncture was not suggestive of meningitis. Computed tomography (CT) and magnetic resonance imaging (MRI) of the brain revealed only old infarcts on a background of microvascular ischemia and age-related involuntional changes. These findings are best appreciated on the MRI brain (see Figure 1). Electroencephalogram (EEG) showed severe diffuse encephalopathy (see Figure 2).

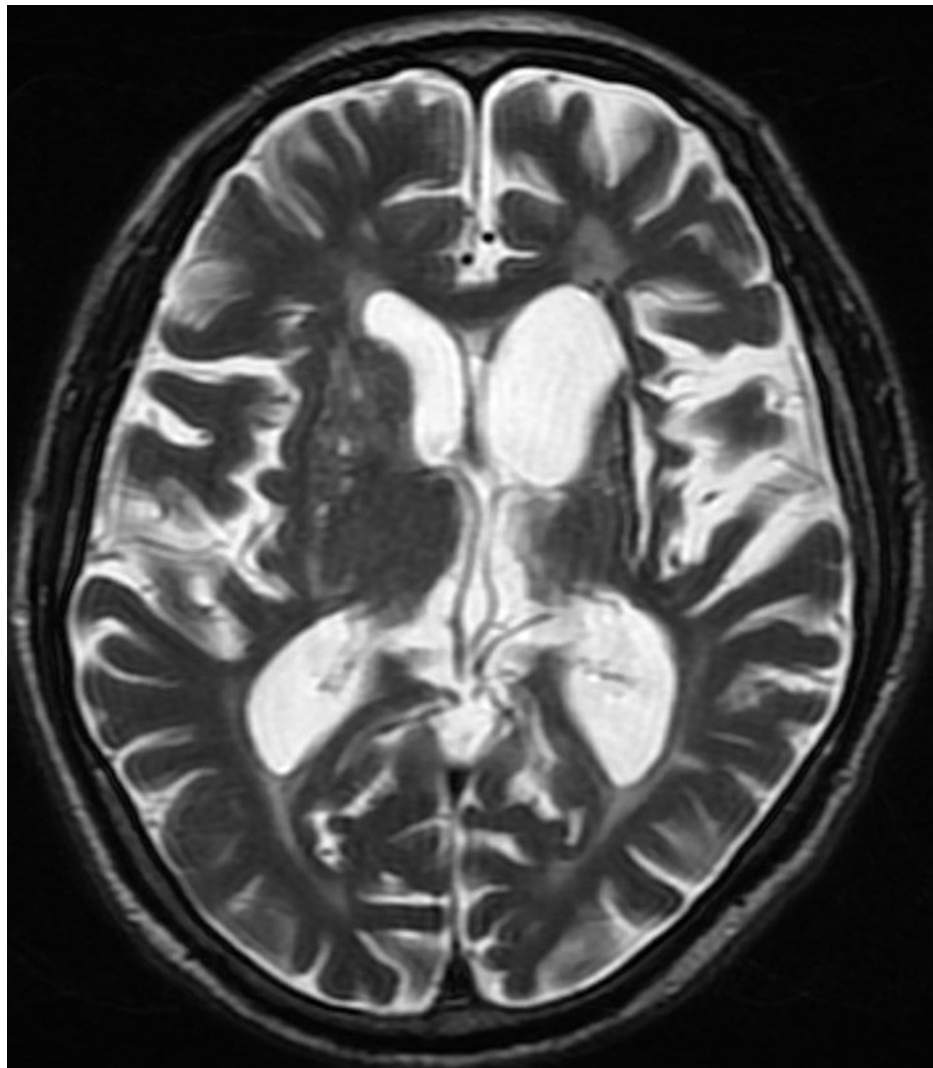
### How to cite this article

Tan R, Neo S, Gan J, et al. (October 06, 2021) Myoclonus From Intoxication by Bismuth Iodoform Paraffin Paste (BIPP) Nasopharyngeal Packing. Cureus 13(10): e18530. DOI 10.7759/cureus.18530



**VIDEO 1: Negative myoclonus is demonstrated in the upper limbs with the patient unable to sustain wrist extension in his outstretched arms, resulting in brief, shock-like, involuntary movements**

View video here: <https://www.youtube.com/watch?v=9e2CPrlP31g>



**FIGURE 1: Magnetic resonance imaging (MRI) brain - a slice of the T2 sequence showing stable gliosis in the left basal ganglia with ex-vacuo dilatation as well as old infarcts in the right basal ganglia**



In these cases, BIPP was placed in close proximity to exposed vascular, visceral, or mucosal surfaces where direct absorption of BIPP into the bloodstream could have led to toxicity. It has also been proposed that when BIPP is placed near neuronal plexi, retrograde transportation of bismuth along the neurons towards the central nervous system may occur [10]. Another proposed mechanism of toxicity is the absorption of bismuth-laden saliva via the gastrointestinal route [5]. It is theorized that intestinal micro-organisms may convert bismuth to its soluble form and contributes to its toxicity [8].

Similar to bismuth, iodoform and iodine toxicity manifests with neuropsychiatric symptoms of malaise, decreased appetite, headache, agitation, depression or delirium [12], drowsiness and semi-coma [13], gastrointestinal symptoms of nausea and vomiting [14], and constitutional symptoms such as fever and tachycardia [12]. Additional findings of toxicity associated with iodine but not iodoform include dermatological eruptions, and laboratory findings of metabolic acidosis, renal failure, neutropenia [12], thyroid dysfunction [15], and liver dysfunction [16]. It is difficult to distinguish the symptoms of intoxication caused directly by iodoform from those caused by the released iodine, as a measurement of blood iodoform concentration level is not possible [12,17]. However, based on pharmacology, high levels of released iodine should suggest iodoform toxicity [12], and concomitant toxicity from both can occur.

In summary, the clinical manifestations of BIPP toxicity are listed in Table 1. Intoxication by the two components of BIPP, iodoform, and bismuth, shares similar neuropsychiatric symptoms of delirium, depression, and coma [12]. Myoclonus, however, is associated with bismuth [18] rather than iodine or iodoform intoxication.

	Iodine/Iodoform intoxication	Bismuth intoxication
Neuropsychiatric	Malaise, decreased appetite, headache, agitation, depression or delirium, drowsiness, coma [12]	Malaise, insomnia, personality change [1], ataxia [19], dysphonia [11], dysarthria [9], gait dyspraxia [11], myoclonic jerks [10], delirium, drowsiness [10], coma [8]
Gastrointestinal	Nausea, vomiting [14, 15]	
Constitutional	Fever, tachycardia [12]	
Dermatologic	Skin iodine eruptions (in iodine toxicity)[12]	

**TABLE 1: Symptoms of iodine/iodoform and bismuth intoxication**

### Case discussion

In our patient, neurotoxicity developed after BIPP nasal packing. Following a period of delirium, characteristic myoclonus was seen in the distal upper limbs (see Video 1), the most common site of bismuth-induced myoclonus [18]. Upon removal, the patient demonstrated characteristic reversibility of symptoms [11] with no residual neurological complications. The clinical symptoms and EEG findings were consistent with that of bismuth encephalopathy, even though blood bismuth levels were not obtained at the beginning of intoxication.

Our patient's altered mental status may also have been aggravated by concomitant iodoform or iodine toxicity from the BIPP packing, as urinary iodine levels were high during the period of symptoms. Iodoform and iodine toxicity likely contributed to the patient's agitation, drowsiness, and delirium. Iodine toxicity may additionally have caused transient thyroid dysfunction and liver enzyme derangement.

The patient's timing of neurological recovery was consistent with the expected time of two weeks to one month following iodoform intoxication [13]. Recovery time following bismuth intoxication is less well established, although rapid improvement has been seen in as fast as two days [20].

In our patient, there were multiple risk factors for intoxication. First, the placement of packing in the nasal and nasopharyngeal cavity allowed bismuth and iodine to enter the gastrointestinal tract via a postnasal drip. Second, the large size of the wound cavity and injured mucous membranes of the nasopharynx and nasal cavity facilitated direct absorption of bismuth and iodine into the bloodstream. Third, the venous drainage of the nasal cavity communicates with the cavernous sinus intracranially through the pterygoid venous plexus, potentially increasing the risk of neurological side effects. Last, renal impairment placed the patient at risk of both bismuth and iodoform toxicity as both substances are excreted renally [5,12,17].

### Conclusions

Popularized in the First World War, BIPP gauze is still being used frequently by maxillofacial surgeons and otolaryngologists worldwide. However, delirium, encephalopathy, and coma can develop from the use of

BIPP gauze. To decrease the risk of intoxication, surgeons should take into account the patient's renal and hepatic function, the size and condition of the wound, and the quantity of packing. Familiarity with the manifestations of BIPP intoxication is necessary for clinicians to promptly diagnose and effectively treat it. Alternative packing materials should also be sought. Since this patient encountered toxicity, we have replaced the BIPP pack with ribbon gauze coated with tetracycline ointment for nasal packing. Flavin-soaked ribbon gauze can be another alternative.

## Additional Information

### Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

### Acknowledgements

We would like to thank Associate Professor Seng Beng Yeo, the Head of Otorhinolaryngology, Department of Tan Tock Seng Hospital, for his review and grant of institutional consent for the publication of this article.

## References

1. Jones JAH: BIPP: a case of toxicity?. *Oral Surg Oral Med Oral Pathol.* 1990, 69:668-71. [10.1016/0030-4220\(90\)90344-R](https://doi.org/10.1016/0030-4220(90)90344-R)
2. Macdonald K, Farboud A, Jardine A: Bismuth iodoform paraffin paste: a review. *J Laryngol Otol.* 2012, 126:1192. [10.1017/S0022215112002113](https://doi.org/10.1017/S0022215112002113)
3. Lim PV, Hughes RG, Oates J: Hypersensitive allergic reactions to bismuth-iodoform-paraffin paste following ear surgery. *J Laryngol Otol.* 1998, 112:355-7. [10.1017/s0022215100140411](https://doi.org/10.1017/s0022215100140411)
4. Saini V, Chalfin R, Leon J, Margolesky J: Pearls & Oy-sters: bismuth neurotoxicity from use of topical bismuth dressing for burns. *Neurology.* 2019, 92:680-1. [10.1212/WNL.00000000000007236](https://doi.org/10.1212/WNL.00000000000007236)
5. Bridgeman AM, Smith AC: Iatrogenic bismuth poisoning. Case report. *Aust Dent J.* 1994, 39:279-81. [10.1111/j.1834-7819.1994.tb05562.x](https://doi.org/10.1111/j.1834-7819.1994.tb05562.x)
6. O'Connor AF, Freeland AP, Heal DJ, Rossouw DS: Iodoform toxicity following the use of B.I.P.P.: a potential hazard. *J Laryngol Otol.* 1977, 91:903-7. [10.1017/s002221510008453x](https://doi.org/10.1017/s002221510008453x)
7. Wainwright P, Cook P: The assessment of iodine status - populations, individuals and limitations. *Ann Clin Biochem.* 2019, 56:7-14. [10.1177/0004563218774816](https://doi.org/10.1177/0004563218774816)
8. Le Quesne PM: Toxic substances and the nervous system: the role of clinical observation. *J Neurol Neurosurg Psychiatry.* 1981, 44:1-8. [10.1136/jnnp.44.1.1](https://doi.org/10.1136/jnnp.44.1.1)
9. Sharma RR, Cast IP, Redfern RM, O'Brien C: Extradural application of bismuth iodoform paraffin paste causing relapsing bismuth encephalopathy: a case report with CT and MRI studies. *J Neurol Neurosurg Psychiatry.* 1994, 57:990-3. [10.1136/jnnp.57.8.990](https://doi.org/10.1136/jnnp.57.8.990)
10. Ovaska H, Wood DM, House I, Dargan PI, Jones AL, Murray S: Severe iatrogenic bismuth poisoning with bismuth iodoform paraffin paste treated with DMPS chelation. *Clin Toxicol (Phila).* 2008, 46:855-7. [10.1080/15563650801953182](https://doi.org/10.1080/15563650801953182)
11. Youngman L, Harris S: BIPP madness; an iatrogenic cause of acute confusion. *Age Ageing.* 2004, 33:406-7. [10.1093/ageing/afh103](https://doi.org/10.1093/ageing/afh103)
12. Matsumura Y, Tsuji A, Izawa J, et al.: Suspected toxicity from an iodoform preparation in a diabetic patient with multiple foot ulcers. *Diabet Med.* 2005, 22:1121-2. [10.1111/j.1464-5491.2005.01571.x](https://doi.org/10.1111/j.1464-5491.2005.01571.x)
13. Araki K, Hirakawa N, Kosugi T, Higashimoto I, Kakiuchi Y, Nakashima M: Iodoform intoxication; a case report of prolonged consciousness disturbance in a patient with a high plasma iodine level. *Fukuoka Igaku Zasshi.* 2007, 98:397-401.
14. Shioda K, Nisijima K, Kobayashi T, Kato S: Iodoform poisoning: an unrecognized cause of consciousness disturbance. *General Hospital Psychiatry.* 2004, 1:83-4. [10.1016/s0163-8343\(03\)00088-4](https://doi.org/10.1016/s0163-8343(03)00088-4)
15. Southern AP, Jwayyed S: *Iodine toxicity.* StatPearls Publishing, Treasure Island, FL; 2021.
16. Numata S, Murayama Y, Makino M, Nakamura A: Temporary stupor in a patient treated with iodoform gauze for mediastinitis after coronary artery bypass grafting. *Interact Cardiovasc Thorac Surg.* 2004, 3:309-10. [10.1016/j.icvts.2004.01.005](https://doi.org/10.1016/j.icvts.2004.01.005)
17. Nakamura K, Inokuchi R, Fujita H, Hiruma T, Matsubara T, Tanaka Y, Yahagi N: Intoxication caused by iodoform gauze packing in necrotizing fasciitis. *J Japanese Soc Intensive Care Med.* 2011, 18:629-31. [10.3918/jsicm.18.629](https://doi.org/10.3918/jsicm.18.629)
18. Slikkerveer A, de Wolff FA: Pharmacokinetics and toxicity of bismuth compounds. *Med Toxicol Adverse Drug Exp.* 1989, 4:303-23. [10.1007/BF03259915](https://doi.org/10.1007/BF03259915)
19. Burns R, Thomas DW, Barron VJ: Reversible encephalopathy possibly associated with bismuth subgallate ingestion. *Br Med J.* 1974, 1:220-5. [10.1136/bmj.1.5901.220](https://doi.org/10.1136/bmj.1.5901.220)
20. Reynolds PT, Abalos KC, Hopp J, Williams ME: Bismuth toxicity: a rare cause of neurologic dysfunction. *Int J Clin Med.* 2012, 3:46-8. [10.4236/ijcm.2012.31010](https://doi.org/10.4236/ijcm.2012.31010)