

Risk of *Clostridium tetani* infection in an elderly patient following hemorrhoid ligation

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Abstract

Tetanus after gastrointestinal surgery is an extremely rare but very dangerous disease caused by infection with *Clostridium tetani*. Tetanus can occur due to bacterial infection during surgery or dressing change, or the bacteria may exist in the patient's intestines and be discharged with feces. This report describes a 71-year-old woman who developed tetanus 3 days after a hemorrhoidal ligation. Clinicians need to be aware of symptoms of *C. tetani* infection that might present in patients who have undergone gastrointestinal procedures.

Keywords

Tetanus, hemorrhoid, gastrointestinal surgery, *Clostridium tetani*, elderly, vaccination

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Introduction

Tetanus is common in low- and middle-income countries but rare in high-income countries.¹ This preventable disease occurs mostly in the elderly and children because of their low immunity. Neonatal tetanus refers to tetanus that occurs within 28 days of birth. China has carried out neonatal tetanus monitoring but there is a lack of accurate research on the incidence of tetanus in the general population. Tetanus infections usually occur following infection of a wound. However, infections through

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hemorrhoid surgeries or other gastrointestinal surgeries are rare. The incidence of postoperative tetanus is 0% to 3.5%, most frequently occurring after intra-abdominal surgery, with about one reported case every year in the United States and one case every 7 years in Canada.² Despite the low number of cases, preventing postoperative tetanus is important because infection can be fatal. Such infections usually develop within 24 hours. In this paper, we present a case of generalized tetanus after hemorrhoid ligation.

Case Report

A 71-year-old woman was admitted to our hospital on 6 October 2019 because of trismus (lockjaw) and dysphagia. Ten days before admission, the patient had undergone hemorrhoid ligation at a local county people's hospital. In the early morning on the third day after operation, the patient was unable to speak clearly and she had a stiff neck. On the fourth postoperative day, the patient had difficulty opening her mouth. The stomatology department suspected inflammation and administered antibiotics. After 8 hours, the symptoms of the patient worsened and the trismus and spasm gradually spread from the neck to the lower extremities; the patient did not lose consciousness during the course of the disease. The patient was transferred to a higher-level hospital but no obvious abnormality was found by cranial computed tomography scan. With a diagnosis of tetanus being considered, the patient was transferred to our hospital for treatment. On admission, her body temperature was 36.8°C, blood pressure was 154/84 mmHg, pulse rate was 47 beats/minute, and respiratory rate was 22 breaths/minute. Skin wounds were not found except for the surgical wound. The patient was conscious but unable to open her mouth, and she had trismus and limited tongue extension.

Cervical stiffness was present, abdominal muscles were slightly tense, and the muscle tension of both upper and lower extremities increased intermittently. Convulsion and seizure were obvious when the muscles of the extremities were touched. A diagnosis of generalized tetanus was made. The patient was sent to the intensive care unit and underwent tracheal intubation. Tetanus antitoxin and human tetanus immunoglobulin were used to neutralize the tetanospasmin, and penicillin and ornidazole were administered to inhibit the proliferation of *Clostridium tetani*. Other treatments were administered in accordance with the patient's symptoms. Seventy-eight days after admission, the patient could walk on flat ground for 100 m unaided. She was discharged and continued to strengthen the lower limb muscles and improve function at home. The patient gave verbal informed consent for publication of this case report.

During treatment, the patient developed several complications. She developed repeated pulmonary infection: *Staphylococcus aureus* and *Klebsiella pneumoniae* were cultured in sputum, and carbapenem-resistant *Acinetobacter baumannii* were cultured in bronchoalveolar lavage fluid. Meropenem and other sensitive antibiotics were administered as the antibacterial treatments. She also had a urinary tract infection and dysuria, caused by *Proteus mirabilis*, for which levofloxacin was prescribed. Anemia and abnormalities of blood coagulation function were diagnosed and were treated by repeated infusion of red blood cells and blood. She developed hypoproteinemia, which was resolved by infusion of human serum albumin and gastric hydrolyzed whey protein, and oral ulcers, which were treated by local application of basic fibroblast growth factor. Finally, because of the long hospitalization and confinement to bed, the patient developed lower limb muscle atrophy and loss of motor ability, as well as left posterior venous thrombosis

and double calf tendon vein thrombosis. Although the patient was treated using anti-coagulation with low-molecular-weight heparin, this condition was not fully recovered by the time she was discharged.

Discussion

The bacterial species that causes tetanus is *Clostridium tetani*. Bacteria of the genus *Clostridium* are gram-positive obligate anaerobes. The spores are widely distributed in the soil and environment. Although the spores cannot reproduce, they disappear after entering the human body and can transform into the reproductive form of *C. tetani*, which release tetanospasmin and cause disease. *Clostridium tetani* can enter human body through damaged skin or mucous membranes, especially with contaminants such as rust, soil, and stool. Infection is common in narrow and deep wounds such as those resulting from epidermal wounds, surgical procedures, insect bites, dental infections, compound fractures, chronic sores and infections, and intravenous drug abuse. These wounds are prone to anaerobic conditions that favor growth of *C. tetani*.

We searched English-language articles from 1964 to 2020 in PubMed for relevant case reports and articles. We used the MeSH keyword “tetanus,” combined with “digestive system surgical procedures,” “surgical procedure operative,” and “hemorrhoid.” All of the relevant articles were reviewed, and their reference lists were examined for other relevant articles. Other articles were obtained and reviewed from these reference lists. We found 19 case reports of tetanus following gastrointestinal procedures.^{3–18} Table 1 outlines the findings and case summaries. In a study of 2422 patients with tetanus, 21.9% of patients did not have significant wound invasion, and it has been speculated that *C. tetani* may also invade the body through small

abrasions.¹⁹ Tetanus may also occur through co-infection with other bacteria.²⁰ There are 20 cases, including ours, of tetanus obtained after gastrointestinal procedures, although infection can occur after other surgeries, such as functional endoscopic sinus surgery²¹ or plastic surgery²². The procedures included resection of small intestine (four cases), cholecystectomy (five cases), cholecystectomy with bile duct exploration (two cases), sigmoidoscopic polypectomy (one case), operation for pericecal abscess due to appendix perforation (one case), drainage of perianal abscess (one case), gastrectomy and transverse colectomy (one case), pyloroplasty and oversewing of duodenal ulcer (one case), exploratory laparotomy (one case), and hemorrhoid ligation (three cases). There are two explanations for *C. tetani* infection after gastrointestinal surgeries: (1) infection can occur during surgery or dressing change, or (2) *C. tetani* may exist in human and animal intestines²⁰ and be discharged with feces. Wounds are prone to contamination with feces following gastrointestinal surgery. Aerobic and facultative anaerobic bacteria consume local oxygen and provide the anaerobic microenvironment that is conducive to growth and reproduction of *C. tetani*. Therefore, hemorrhoids or other gastrointestinal surgeries are high-risk procedures for *C. tetani* infection. Even though it is rare, doctors should be aware of the early clinical signs caused by *C. tetani* infection in the gastrointestinal tract, such as dysphagia, trismus, neck stiffness or pain, and muscle twitch.

Tetanus is a deadly yet vaccine-preventable disease, and it is more common in elderly patients than in younger individuals. According to Table 1, all patients were adults and 58% were elderly; 4 of the 18 patients with known outcomes died as a result of *C. tetani* infection. The lower immunity of older adults might explain the more severe symptoms.

Table 1. Summary of case reports identified in the literature of tetanus following gastrointestinal procedures.

Operation	Reference	Age (years) and sex	Latent time (days)	Initial symptoms	Definitive	Tetanus immunization	Outcome	Country
Resection of small intestine (n = 4)	Furui et al., 1998 ³	75 M	1	Jerking, limb rigidity	Opisthotonus	No	Alive	Japan
	Clay et al., 1964 ⁴	61 M	2	Jerking	Opisthotonus	NM	Alive	USA
	Mori et al., 2012 ⁵	84 F	3	Leg rigidity	Opisthotonus	No	Alive	Japan
	Strypstein et al., 2019 ⁶	79 F	2	Neck stiffness, trismus	Opisthotonus, trismus	NM	Alive	Belgium
Cholecystectomy (n = 5)	Crokaert et al., 1984 ⁷	44 NM	6	Neck and face pain, stiffness	Opisthotonus	NM	NM	Belgium
	Parker et al., 1984 ⁸	47 F	10	NM	Trismus	Uncertain	Alive	UK
Cholecystectomy with bile duct exploration (n = 2)	Parker et al., 1984 ⁸	59 F	17	Spastic gait	NM	NM	Dead	UK
	O'Riordain et al., 1991 ⁹	46 M	11	Abdominal spasm, pain, fever, mild trismus	Trismus	No	Dead	Ireland
	Mayall et al., 1998 ¹⁰	68 M	NM	NM	NM	NM	Dead	Australia
	Lennard et al., 1984 ¹¹	49 F	12	Subcostal pain, abdominal distension	Opisthotonus	No	Alive	UK
Sigmoidoscopy/coloproctectomy (n = 1)	Lennard et al., 1984 ¹¹	66 F	16	Abdominal pain	Trismus	No	Alive	UK
	Segel et al., 1969 ¹²	55 F	10	Jerking	Trismus	No	Alive	South Africa
	Federmann et al., 1989 ¹³	57 M	12	Uncertain	Uncertain	Uncertain	Alive	German
Operation for pericecal abscess due to perforation of the appendix (n = 1)	Myers et al., 1984 ¹⁴	62 M	10	Limb rigidity, restlessness	Trismus	No	Alive	USA
	Fleshner et al., 1988 ¹⁵	48 M	21	Abdominal pain, fever	Trismus, opisthotonus	No	Alive	USA
Pyloroplasty and oversewing of duodenal ulcer (n = 1)	Katz et al., 2000 ¹⁶	77 F	8	Painless trismus	Trismus	Uncertain	Alive	Canada
	Parker et al., 1984 ⁸	65 F	12	NM	NM	No	Dead	UK
Exploratory laparotomy (n = 1)	Murphy et al., 1978 ¹⁷	33 F	7	Dysphagia, neck pain	Trismus	No	Alive	UK
	Kasher et al., 2007 ¹⁸	63 F	4	Dysphagia	Trismus	No	Alive	USA
	Present case, 2019	71 F	3	Trismus, dysphagia	Trismus, opisthotonus	No	Alive	China

NM: Not mentioned.

In China, the tetanus vaccine was licensed in 1982.²³ Even before the vaccine was licensed in China, immunization targeting children was planned in the 1970s, although it was never carried out. Almost all patients with tetanus in the United States were born in 1940 or earlier because the tetanus vaccine used in the United States was approved in 1940.²⁴ A similar situation exists in the United Kingdom, where all patients with tetanus were born before the tetanus vaccine was approved in 1961.²⁵ All patients from Japan and Canada who developed postoperative tetanus were born before vaccines were licensed in 1968²⁶ and 1940²⁷ in those countries, respectively. Many adults who were born before vaccine licensing did not receive the tetanus vaccine; consequently, they were at higher risk of developing tetanus. The tetanus vaccine can be monovalent, such as tetanus toxoid; combined with diphtheria toxoid or low-dose diphtheria toxoid as a bivalent vaccine; or in a trivalent combination with diphtheria and pertussis toxoid,²⁸ such as DTaP in children or Tdap in adolescents and adults.²⁹ Aside from diphtheria and pertussis, some countries have combined tetanus toxoid vaccine with hepatitis B, polio, or *Haemophilus influenzae* type B vaccines. Even though the tetanus vaccine has a good protective effect on young people, the concentration of tetanus antibody declines with age. Therefore, regular boosters for the tetanus vaccine targeting adults should be implemented in China.

Conclusion

The incidence of tetanus after gastrointestinal surgery is rare, but when it occurs, the mortality rate is high. Patients who survive can develop drug-resistant bacterial infections, anemia, hypoproteinemia, and complications such as muscle atrophy, which can seriously affect quality of life. Therefore, surgeons need to pay attention

to patients with tetanus-related symptoms after gastrointestinal procedures so that they can diagnose the infection and administer appropriate medical treatments early. In addition, we suggest preoperative testing for tetanus antibodies, and preoperative tetanus vaccine and tetanus antitoxin injection to be administered before gastrointestinal surgeries, particularly for the elderly or individuals who have never been vaccinated against tetanus.


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References

1. Yen LM and Thwaites CL. Tetanus. *Lancet* 2019; 393: 1657–1668.
2. Dhalla S. Postsurgical tetanus. *Can J Surg* 2004; 47: 375–379.
3. Furui J, Enryoji A, Susumu S, et al. Tetanus after a resection for a gangrenous perforated small intestine: report a case. *Surg Today* 1999; 29: 626–628.
4. Clay RC and Bolton JW. Tetanus arising from gangrenous unperforated small intestine. *JAMA* 1964; 187: 856–858.
5. Mori, M, Iida, H, Miki, K. et al. Postoperative tetanus after laparoscopic obturator hernia repair for strangulated

- ileus: report of a case. *Surg Today* 2012; 42: 470–474.
6. Strypstein S, Claeys S, Smet B, et al. Forgotten pathogen: tetanus after gastrointestinal surgery. *BMJ Case Rep* 2019; 12: e229701.
 7. Crokaert F, Glupczynski Y, Fastrez R, et al. Postoperative tetanus. *Lancet* 1984; 323: 1466.
 8. Parker L and Mandal BK. Postoperative tetanus. *Lancet* 1984; 2: 407.
 9. O'Riordain DD, Buckley DJ and Kirwan WO. Tetanus following cholecystectomy. *Ir J Med Sci* 1991; 160: 310.
 10. Mayall BC, Snashall EA and Peel MM. Isolation of *Clostridium tetani* from anaerobic empyema. *Pathology* 1998; 30: 402–404.
 11. Lennard TWJ, Gunn A, Sellers J, et al. Tetanus after elective cholecystectomy and exploration of the common bile duct. *Lancet* 1984; 323: 1466–1467.
 12. Segel J and Shaff BL. An unusual case of postoperative tetanus. *S Afr Med J*. 1969; 43: 1556–1557.
 13. Federmann M and Kotzerke M. Postoperative tetanus. *Dtsch Med Wochenschr* 1989; 114: 1833–1836.
 14. Myers KJ, Heppell T, Bode WE, et al. Tetanus after anorectal abscess. *Mayo Clin Proc* 1984; 59: 429–430.
 15. Fleshner PR, Hunter JG and Rudick J. Tetanus after gastrointestinal surgery. *Am J Gastroenterol*. 1988; 83: 298–300.
 16. Katz KC and Walmsley SL. Postoperative tetanus: a case report. *CMAJ* 2000; 163: 571–573.
 17. Murphy KJ. Tetanus after rubber-band ligation of haemorrhoids. *Br Med J* 1978; 1: 1590–1591.
 18. Kasher JA and Mathisen G. Acquiring tetanus after hemorrhoid banding and other gastrointestinal procedures. *J Gastrointest Surg* 2007; 11: 515–519.
 19. Thwaites CL, Yen LM, Nga NT, et al. Impact of improved vaccination programme and intensive care facilities on incidence and outcome of tetanus in southern Vietnam, 1993–2002. *Trans R Soc Trop Med Hyg* 2004; 98: 671–677.
 20. Sexton DJ, Bartlett JG, Thorner AR. Tetanus. Accessed December 20, 2020. <http://www.uptodate.com>.
 21. Marullo G, Bottani GM, Guerrieri R, et al. A case of lockjaw in the emergency department. *Emergency Care Journal* 2018; 14: 7410.
 22. Park D, Kim JS and Heo SJ. Tetanus presenting primarily as periocular discomfort in a patient who underwent surgery for sleep apnea: A case report and brief literature review; *Medicine* 2019; 98: 23.
 23. Zheng Y, Rodewald L, Yang J, et al. The landscape of vaccines in China: history, classification, supply, and price. *BMC Infect Dis* 2018; 18: 502.
 24. Hinfey PB. Tetanus. Accessed February 20, 2020. Available on Medscape website <https://emedicine.medscape.com/article/229594-overview>
 25. Salisbury D., Ramsay M., Noakes K. (2006). *Immunisation against infectious disease (the 'Green Book')*. London: The Stationary Office. Available at: <http://immunisation.dh.gov.uk/category/the-green-book/>
 26. Tetanus in Japan as of 2001. Infectious Agent Surveillance Report (IASR). 2002; 23: 1–2.
 27. Canadian Public Health Association. Immunization timeline. Accessed February 10, 2020. Available on CPHA website <https://www.cpha.ca/immunization-timeline>
 28. WHO. International travel and health, Vaccines, Tetanus. Accessed February 20, 2020. <https://www.who.int/ith/vaccines/tetanus/en/>
 29. Centers for Disease Control and Prevention. Diphtheria, Tetanus, and Pertussis Vaccines. Accessed February 20, 2020. Available on CDC website <https://www.cdc.gov/vaccine-safety/vaccines/dtap-tdap-vaccine.html>