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# Fournier's gangrene with dapagliflozin in a rural hospital: a case report

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## SUMMARY

Sodium-glucose cotransporter 2 (SGLT2) inhibitors, which are used for treatment of type 2 diabetes, are associated with risk of urogenital infections. FDA issued a black box warning about multiple case reports of Fournier's gangrene (FG) observed in patients taking SGLT2 inhibitors. FG is a type of necrotising fasciitis that occurs in the anogenital area. We report a case of a 71-year-old woman with type 2 diabetes on dapagliflozin, presenting with foul-smelling discharge and a large abscess in the perianal area. Her risk factors for FG included her advanced age, obesity, diabetes and trauma to the site. During her stay, dapagliflozin was discontinued and she received procedural debridement, wound care and broad-spectrum intravenous antibiotics. Due to possible association between FG and SGLT2 inhibitors, patients presenting with signs and symptoms of FG who are taking SGLT2 inhibitors should be examined for infection in the urogenital area and treated promptly.

## BACKGROUND

Dapagliflozin is a sodium-glucose cotransporter 2 (SGLT2) inhibitor used to lower blood glucose in adults with type 2 diabetes. In addition to their ability to lower blood glucose, SGLT2 inhibitors have beneficial effects on blood pressure and weight loss and have a low risk of hypoglycaemia. Emerging evidence has also demonstrated the benefits of SGLT2 inhibitors in cardiovascular disease, chronic kidney disease and heart failure (EMPA-REG (empagliflozin), CANVAS (canagliflozin) and DECLARE TIMI-58 (dapagliflozin), respectively).<sup>1-3</sup> This class of antihyperglycaemic medications reduces blood glucose by increasing glucose excretion in the urine. Because of this glycosuric effect, bacterial growth resulting in genitourinary infections are commonly reported adverse effects of SGLT2 inhibitors.<sup>4</sup> However, many prescribers continue to select dapagliflozin for its positive renal outcomes and cardiac benefits after carefully weighing it against the risk of urogenital infection and diabetic ketoacidosis.<sup>3</sup>

Concerns that SGLT2 inhibitors may be associated with more serious infections emerged after the FDA issued a black box warning in 2018.<sup>4</sup> This warning described twelve cases of Fournier's gangrene (FG) that occurred in patients taking the SGLT2 inhibitors dapagliflozin, canagliflozin and empagliflozin.<sup>5</sup> FG, also known as necrotising fasciitis of the perineum, is a rare, rapidly progressing and potentially fatal urological emergency. Because FG is usually polymicrobial, treatment requires

urgent surgical debridement and administration of broad-spectrum antimicrobials.<sup>2</sup> Prior to this, the FDA had issued a black box warning for canagliflozin regarding leg and foot amputation risk which was removed in 2020, but remained described in the "Warnings and Precautions" section of the prescribing information.<sup>6</sup>

Risk factors for FG include diabetes, local trauma, male gender, obesity, older age, immunosuppression, HIV infection, end-stage renal or liver failure, smoking and alcohol abuse.<sup>7</sup> The level of blood glucose control is important as uncontrolled diabetes has been linked to more severe infections requiring greater interventions and worse outcomes. Interestingly, although male gender is a risk factor for the development of FG, cases of FG occurring in patients taking SGLT2 inhibitors have been observed in males and females at similar frequencies.<sup>1,4</sup>

We present a case of FG that developed in a patient taking dapagliflozin. The patient was treated with multiple debridement procedures and broad-spectrum antibiotics. Other case reports have described the development of FG associated with SGLT2 inhibitors.<sup>8-11</sup> However, this is the first case

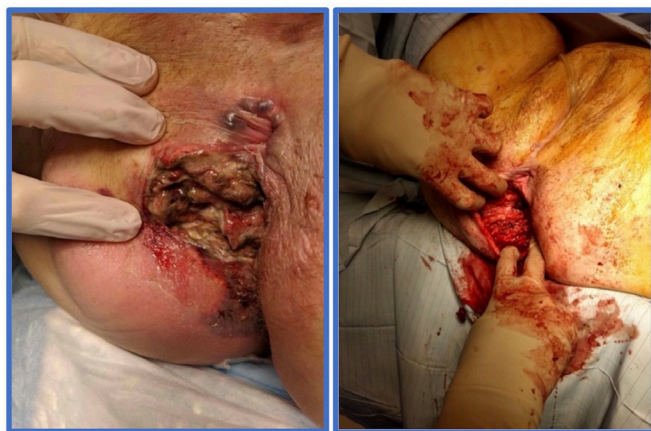


**Figure 1** Necrotising tissue observed in examination.



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**Figure 2** Operative procedures on fifth day of admission.

report portraying a female patient who developed FG while taking dapagliflozin.

### CASE PRESENTATION

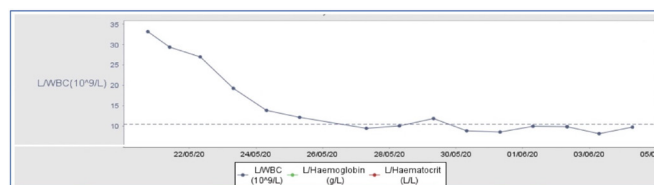
A 71-year-old female patient presented to the emergency department (ED) of a rural hospital in Ontario, Canada after a fall in her bathroom. The patient's medical history was significant for type 2 diabetes treated with glimepiride, dapagliflozin and linagliptin; hypertension treated with trandolapril, amlodipine and bisoprolol; and hypercholesterolemia treated with rosuvastatin. The patient has been taking dapagliflozin for 5 years and has been diabetic for 8 years. She was not complaining of pain but had experienced some discomfort for a few days. On examination by the medical team, an extensive abscess was observed in the perianal area with 5 cm of necrotic tissue and foul-smelling discharge (figure 1). This was located in right ischio-rectal fossa and was evaluated to be an advanced infection. She was given a single intravenous dose of 3.375 g piperacillin-tazobactam in the ED and admitted for emergency surgery and debridement. The procedures included incision, drainage and debridement of the right ischio-rectal fossa abscess.

### INVESTIGATIONS

At presentation, her blood pressure was 139/69 mmHg, her heart rate was 118 bpm and her temperature was 36.2°C (97.2°F). Her HbA1c was 11.7% (104 mmol/mol IFCC) and her random blood plasma glucose was 25.4 mmol/L. She presented with leucocytosis and neutrophilia with a white blood cell count of  $33.2 \times 10^9/L$  and a neutrophil count of  $29 \times 10^9/L$ . Her potassium level stayed around 3.4 mEq/L during the admission and the platelet reported at  $95 \times 10^9/L$ . Her serum creatinine was 209  $\mu\text{mol/L}$  (Cockcroft-Gault eGFR of 22 mL/min/1.73 m<sup>2</sup>). Her



**Figure 3** Debridement on day 7 of admission.



**Figure 4** Blood test results over the duration of stay at the hospital. WBC, white blood cell.

urinalysis was positive for glucose, ketones, blood and protein, and negative for leucocytes and nitrates. Her high serum creatinine and proteinuria may have been an indication for chronic kidney disease secondary to uncontrolled diabetes; however, more serum creatinine measurements were required to definitively describe her kidney status.

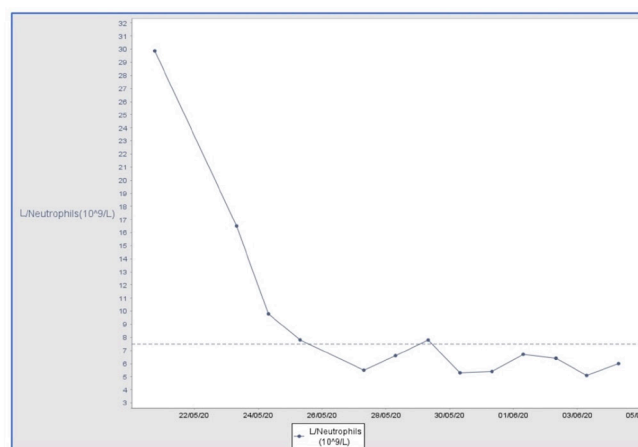
### TREATMENT

On day 2 of admission, she was started on intravenous vancomycin 2g, intravenous piperacillin-tazobactam and intravenous clindamycin. Based on the therapeutic drug monitoring and trough levels, vancomycin was put on hold after 2 days. She received operations on days 3 and 6 (figures 2 and 3), which included debridement, rigid sigmoidoscopy and perianal ring block. On day 8 of admission, she received another debridement of the wound and dressing change.

During her stay at the hospital, her blood pressure medications were continued as normal, except for trandolapril which was substituted for perindopril due to availability on hospital formulary. Her blood pressure remained consistent until day 5, at which time it increased and remained elevated for a few days thereafter. Her dose of perindopril was subsequently increased, and she also received hydralazine on day 8 of admission.

To compensate for dapagliflozin being discontinued, the doses for her other diabetes medications were increased. She was also initiated on insulin glargine 10 U with breakfast and insulin aspart three times daily on a low-moderate sliding scale. Her random blood glucose measurement was lowered to 18.6 mmol/L on day 2 and 6.7 mmol/L by day 5 of admission. The random blood glucose values remained stable and within target range between 5 and 6 mmol/L until discharge.

Her dressings were changed daily after each bowel movement and as needed. An obstetric bed was used to assist dressing changes and she was referred to a dietician to optimise her diet for diabetes management and promote wound healing.



**Figure 5** Neutrophil count over the duration of stay at the hospital.

**Table 1** Published case reports on Fournier's gangrene in patients on SGLT2 inhibitors

Case report	Kumar et al <sup>9</sup>	Onder et al <sup>10</sup>	Nagano et al <sup>15</sup>	Rodler et al <sup>16</sup>	Elbeddini et al <sup>8</sup>
Age	41	64	34	39	72
Sex	Male	Male	Male	Male	Male
SGLT2	Empagliflozin (14 months ago)	Dapagliflozin (6 months ago)	Empagliflozin (~5 months ago)	Dapagliflozin (4 years)	Canagliflozin (6 years)
Other diabetes medications	Metformin	Premixed insulin Vildagliptin Metformin	Glibenclamide Sitagliptin	Metformin Sitagliptin	Metformin Sitagliptin Insulin glargine
Risk factors	Type 2 diabetes Sex Current smoker Obesity (BMI 38 kg/m <sup>2</sup> ) Recurrent fungal infection Urinary catheterisation/ operative procedures	Type 2 diabetes Sex Ex-smoker (35 pack-years) Obesity (33 kg/m <sup>2</sup> )	Type 2 diabetes Sex	Type 2 diabetes Sex Smoker Obesity	Type 2 diabetes Sex Age History of radiotherapy to perianal area
Presenting symptoms	Scrotal swelling, history of multiple episodes of genital thrush Afebrile	Scrotal pain, swelling and redness that had progressed over a period of 3 days Painful haemorrhoids	Pain and swelling in the perineum	Fever (1 week), swelling and pain in groin and testicles with pus discharge	Severe abdominal pain, nausea
Blood glucose levels	Plasma glucose on presentation was 19.9 mmol/L HbA1c 8.8%	Plasma glucose on presentation was 14.4 mmol/L HbA1c 7.4%	Plasma glucose was 6.1 mmol/L at presentations HbA1c 6.5%	Plasma glucose on presentation 16.8 mmol/L HbA1c 10%	HbA1c 7.5%
Perineal examination	Grossly swollen and indurated scrotum with bilateral inguinal lymphadenopathy	Tender and indurated scrotum and bilateral inguinal lymphadenopathy	Skin redness, induration, swelling and tenderness observed in the perineum, scrotum and left inguinal region	Swelling in right groin, intense smell	Red, tender scrotum with peeling skin, indurated perineum
Imaging	CT revealed features consistent with Fournier's gangrene (FG)	Scrotal Doppler ultrasonography: an increase in the thickness of subcutaneous tissues, increased free fluid and echogenic foci	CT scan of the lower abdomen and pelvis revealed findings consistent with FG	Ultrasound revealed normally perfused testicles and several abscesses in the groin	CT scan positive for gas- forming infection in ischioanal fossa and suspicious for perianal fistula
Wound management	Emergency exploration, debridement, application of vacuum dressing	Debridement Excision of necrotic tissues and abscess pouches in the left gluteal region, scrotum and lower abdomen Placement of colostomy	Surgical incision, and debridement and drainage	Removal of necrotic tissue and further debridement procedures	Loop sigmoid colostomy, multiple debridement procedures, negative pressure dressing and rectal tube
Culture results	Operative cultures: heavy polymicrobial growth of <i>Streptococcus anginosus</i> , mixed anaerobes and Gram-negative bacilli	Information not available	Methicillin-resistant <i>Staphylococcus aureus</i>	Day 3: culture of smears from the groin and scrotum were positive for <i>Peptostreptococcus anaerobius</i> Subsequent cultures: positive for <i>Candida albicans</i>	<i>Bacteroides ovatus</i> , <i>Prevotella dentiola</i> and <i>Actinomyces</i> species
Antimicrobial use	2-week course of intravenous antibiotics (amoxicillin, gentamycin and vancomycin, changed to intravenous meropenem), discharged home with oral antibiotics	4-week course of intravenous antibiotics (ceftriaxone 1 g twice a day and metronidazole 500 mg three times a day)	3-week course of intravenous antibiotics (meropenem and clindamycin which was changed to vancomycin after MRSA was cultured)	3-week course of intravenous antimicrobials (gentamicin and piperacillin-tazobactam started in ED was changed to linezolid, meropenem and nystatin on day 2; linezolid stopped after 3 days and meropenem and nystatin changed to fluconazole on day 11)	8 days of intravenous antibiotics (meropenem, vancomycin, clindamycin), step down to 6 days of oral antibiotics (sulfamethoxazole- trimethoprim, ciprofloxacin and metronidazole)
Medication management	Discontinue empagliflozin Initiate basal bolus insulin	Discontinue dapagliflozin Initiate basal bolus insulin	Sitagliptin restarted 9 days after surgery Metformin started 21 days after surgery Insulin initiated according to sliding scale	Dapagliflozin discontinued Basal-bolus insulin from admission to day 19 Metformin and sitagliptin restarted on day 23 of admission	Canagliflozin discontinued; remaining home medications continued as before

BMI, body mass index; ED, emergency department; MRSA, methicillin-resistant *Staphylococcus aureus*; SGLT2, sodium-glucose cotransporter 2.

The perineum swab collected on admission revealed rare polymorphonuclear leucocytes, rare epithelial cells, many Gram-positive cocci, many Gram-negative bacilli and a few Gram-positive bacilli. It showed heavy growth of *Streptococcus anginosus* susceptible to penicillin and clindamycin. Clindamycin and piperacillin-tazobactam were continued for 7 days. The blood culture and the urine culture tests came back as negative.

## OUTCOME AND FOLLOW-UP

Our patient had uncontrolled diabetes and experienced trauma to the perianal area after sustaining a fall. Other risk factors in

this patient included obesity and older age. The uncontrolled diabetes potentially prolonged the healing process and treatment of the infection. However, by day 8 of the admission, white blood cell average was  $9 \times 10^9/L$  and neutrophil average was  $6 \times 10^9/L$  (figures 4 and 5). After 14 days of hospitalisation, the patient was discharged with controlled blood glucose under insulin administration, and a clean and odourless wound.

Given that her serum creatinine was high throughout her stay at the hospital and protein was observed in her urine, she may have been suffering from stage G4 (severe) diabetic kidney disease with microalbuminuria, which is common among



## Case report

patients with uncontrolled diabetes. This requires multiple dose adjustments to chronic medications that are cleared renally on discharge. Other important pieces of information that should be shared on discharge include diabetes education and demonstrating insulin use techniques.

## DISCUSSION

FG is a life-threatening and rapidly progressing necrotising fasciitis of polymicrobial aetiology involving the perineal and genital areas. We have herein presented a case of management of FG including sequential aggressive debridement procedures and broad-spectrum antibiotic therapy. Although more commonly described in the literature for men, this is the first published report, to our knowledge, of FG occurring in a woman on a SGLT2 inhibitor.

FG shows vast heterogeneity in clinical presentation from innocuous cellulitis adjacent to the portal of entry or source of infection, to severe pain, oedema and systemic features.<sup>12</sup> The patient's chief complaint included discomfort in the perianal area; a large abscess with foul-smelling discharge in the absence of fever was further discovered on physical examination; however, this was not described by the patient as a primary concern. Interestingly, this presentation differs from the FDA warning detailing the symptoms of FG which include symptoms of tenderness, redness, or swelling of the genitals or the area from the genitals back to the rectum, with an elevated temperature over 100.4°F. Crepitus of the inflamed tissues is also a common feature due to the presence of gas-forming organisms, although was not present in the evaluated patient. Imaging techniques such as CT scans can be used to confirm diagnosis; however, this was not required in the present case. Laboratory investigations were significant for leucocytosis and neutrophilia with a white blood cell count of  $33.2 \times 10^9/L$  and neutrophil count of  $29 \times 10^9/L$ , which is consistent with other case reports in the literature that also describe leucocytosis, thrombocytopenia, electrolyte derangements and elevated inflammatory markers. The location of FG occurred in the perianal area, but commonly originates from the gastrointestinal tract, genitourinary tract and the skin.

Comorbid systemic disorders and additional risk factors are being identified in patients with FG, with diabetes mellitus and alcohol misuse being among the most common concern in 20%–70% and 25%–50% of patients, respectively.<sup>12</sup> Other risk factors described in the literature include immunosuppression, chemotherapy, chronic corticosteroid use, liver disease and kidney disease. The patient described had multiple risk factors for the development of FG including uncontrolled diabetes, possible poor kidney function and use of a SGLT2 inhibitor. FG is usually secondary to infections with local trauma, operative procedures or urinary tract disease as these events provide portals of entry for bacteria causing FG; however, a minority of cases remain idiopathic. In the present patient, an event, namely a fall, was implicated in the development of FG thereby allowing identification of the source of infection.

Management of FG included urgent debridement of the necrotic tissue, followed by broad-spectrum antibiotics. The Infectious Disease Society of America recommends that empiric antimicrobial therapies for FG cover aerobic and anaerobic bacteria, including methicillin-resistant *Staphylococcus aureus* (MRSA). Common pathogens are those found on the skin including *Staphylococcus* and *Streptococcus* species as well as genitourinary bacteria like *Escherichia coli* and *Bacteroides* species. Empiric antimicrobial therapy should include vancomycin or linezolid to cover MRSA plus either piperacillin-tazobactam, a carbapenem,

or the combination of ceftriaxone and metronidazole for broad-spectrum coverage. If streptococcal species are suspected, a penicillin plus clindamycin should be used.<sup>13</sup> Since this case was believed to be a polymicrobial necrotising fasciitis, vancomycin, piperacillin and clindamycin were initiated and then intravenous antibiotics were tailored once swab culture came positive with heavy growth of *S. anginosus*. Vancomycin was kept on hold and the patient continued on piperacillin and clindamycin. This combination is important as clindamycin reduces the virulence of streptococcal species and improves outcome regardless of resistance.<sup>14</sup> A beta-lactam is added to clindamycin because of concerns regarding resistance to clindamycin.

There is not enough evidence to propose a causal relationship between FG and use of SGLT2 inhibitors. However, between March 2013 and January 2019, fifty-five cases of FG were reported to the FDA in patients on SGLT2 inhibitors. Out of the 55, 16 cases were linked to dapagliflozin, 18 linked to empagliflozin and 21 linked to canagliflozin.<sup>4</sup> A recent case report published by Elbeddini *et al* presented a case of an elderly male patient on canagliflozin who developed FG.<sup>8</sup> Other published case reports, all males, are described in detail in table 1.<sup>8–10 15 16</sup> In the present study, however, we presented an elderly female patient on dapagliflozin who developed FG in the perianal area but did not present to the ED with classical symptoms of FG.

## Learning points

- ▶ The causal relationship between Fournier's gangrene (FG) and sodium-glucose cotransporter 2 inhibitors have not been extensively demonstrated.
- ▶ Given the emergency nature of FG, prompt diagnosis and treatment of this condition is really important.
- ▶ Many physicians choose dapagliflozin for its positive renal outcome or cardiac benefits, but the benefits should be weighed against the risk of urogenital infection and diabetic ketoacidosis.

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#### REFERENCES

- Zinman B, Wanner C, Lachin JM, *et al.* Empagliflozin, cardiovascular outcomes, and mortality in type 2 diabetes. *N Engl J Med Overseas Ed* 2015;373:2117–28.
- Neal B, Perkovic V, Mahaffey KW, *et al.* Canagliflozin and cardiovascular and renal events in type 2 diabetes. *N Engl J Med* 2017;377:644–57.
- Wiviott SD, Raz I, Bonaca MP, *et al.* Dapagliflozin and cardiovascular outcomes in type 2 diabetes. *N Engl J Med Overseas Ed* 2019;380:347–57. doi:10.1056/NEJMoa1812389
- Bersoff-Matcha SJ, Chamberlain C, Cao C, *et al.* Fournier gangrene associated with sodium-glucose cotransporter-2 inhibitors: a review of spontaneous postmarketing cases. *Ann Intern Med* 2019;170:764–9.
- U.S. Food and Drug Administration. FDA warns about rare occurrences of a serious infection of the genital area with SGLT2 inhibitors for diabetes, 2018. Available: <https://www.fda.gov/drugs/drug-safety-and-availability/fda-warns-about-rare-occurrences-serious-infection-genital-area-sgl2-inhibitors-diabetes>
- US Food and Drug Administration. FDA removes boxed warning for type 2 diabetes medicine canagliflozin, 2020. Available: <https://www.fda.gov/drugs/drug-safety-and-availability/fda-removes-boxed-warning-about-risk-leg-and-foot-amputations-diabetes-medicine-canagliflozin> [Accessed 26 Oct 2020].
- Singh A, Ahmed K, Aydin A, *et al.* Fournier's gangrene. A clinical review. *Arch Ital Urol Androl* 2016;88:157–64.
- Elbeddini A, Gallinger J, Davey M, *et al.* A case of Fournier's gangrene in a patient taking canagliflozin for the treatment of type II diabetes mellitus. *Am J Case Rep* 2020;21:e920115–1.
- Kumar S, Costello AJ, Colman PG. Fournier's gangrene in a man on empagliflozin for treatment of type 2 diabetes. *Diabet Med* 2017;34:1646–8.
- Onder CE, Gursoy K, Kuskonmaz SM, *et al.* Fournier's gangrene in a patient on dapagliflozin treatment for type 2 diabetes. *J Diabetes* 2019;11:348–50.
- Sunumu V, Dapagliflozin FB, Fiks B. Case report: fixed drug eruption caused by dapagliflozin. *Case Rep Turk J Endocrinol Metab* 2019;23:64–7.
- Thwaini A, Khan A, Malik A, *et al.* Fournier's gangrene and its emergency management. *Postgrad Med J* 2006;82:516–9.
- Stevens DL, Bisno AL, Chambers HF, *et al.* Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. *Clin Infect Dis [Internet]* 2014;59:e10–52.
- Andreoni F, Zürcher C, Tarnutzer A, *et al.* Clindamycin affects group A Streptococcus virulence factors and improves clinical outcome. *J Infect Dis* 2017;215:269–77.
- Nagano Y, Yakame NK, Aoki H, *et al.* Fournier's gangrene in a patient with type 2 diabetes mellitus treated with empagliflozin: a case report. *Drug Saf* 2019;6:1–5.
- Rodler S, Weig T, Finkenzeller C, *et al.* Fournier's gangrene under sodium-glucose cotransporter 2 inhibitor therapy as a life-threatening adverse event: a case report and review of the literature. *Cureus* 2019;11:e5778.

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