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Case Study

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A CASE STUDY AND CLINICAL LITERATURE REVIEW OF FOURNIER'S GANGRENE, DEMONSTRATING RESOLUTION WITH ANTIBIOTIC THERAPY AND IN THE ABSENCE OF SURGICAL OR ANY OTHER INTERVENTION

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ABSTRACT

This case report describes a lesser common condition, namely Fournier's gangrene, involving a rapidly advancing, necrotising infection of deep tissues, starting from the perineal area with spread along fascial planes. The aggressive nature of this condition renders early diagnosis and treatment imperative. Our case is unusual in that we achieved good results utilising intravenous antibiotics alone, guided appropriately via culture and sensitivities. This contrasts with the general literature that advocates for concomitant surgical debridement and/or other measures as outlined in the literature review in order to optimise outcome. Our view is that in frail, elderly or 'high risk' patients the surgical and other wound management interventions are likely to increase mortality and that it may be possible to achieve success in such circumstances utilising antibiotics alone, particularly if the condition is recognised early.

KEYWORDS: Necrotising; Polymicrobial; Antibiotics; Frail.

INTRODUCTION

Fournier's gangrene (FG) is a severe form of infective necrotising fasciitis of the perineal, perianal, and periurethral tissues usually commencing as cellulitis close to the pathogens' site of entry. Rapid progress and ensuing gangrene may lead to sepsis, multiple organ failure and death if the patient is not treated aggressively. An insidious, smouldering variant is also recognised.

Common presentations include fever and scrotal pain, hyperaemia and swelling. Crepitus is common in the inflamed tissues, due to insoluble gas produced by anaerobic bacteria (subcutaneous emphysema), this is absent in 10% of cases.[4] As infection spreads along the fascial planes.[6][7][8], the rate of fascial necrosis can be as high as 2-3cm per hour[4] and leads to bruising/ ecchymoses.

FG incidence and outcome is also determined by well recognised risk factors and these have been incorporated into several tools, of which the FGSI (Fournier's gangrene severity index) remains the most popular, in an attempt to predict outcome and flag more serious cases. Such risk factors include male sex, diabetes mellitus, organ failure, sepsis on admission, anaemia, raised urea and creatinine levels and deranged potassium levels, together with the surface area of affected tissue.[16][17][18]

The testes are generally spared since they are supplied by the testicular artery from the aorta, involvement of the testes indicates retroperitoneal spread or origin. Anorectal infections commence perianally, as clue to the original focus of infection.[2][11] Cultural and sexual practices, with attendant stigma associated with the genitalia should also raise the level of suspicion during clinical examination.[14]

MATERIALS AND METHODS

Case description

We describe the case of a gentleman in his eight decade of life with a past medical history of hypertension, diabetes mellitus, atrial fibrillation, ischaemic heart disease, congestive heart failure, cerebrovascular disease, peripheral vascular disease and advanced vascular dementia.

Originally he was admitted to the general acute care hospital with a long-standing, neglected ulcer on the right second toe, which appeared infected, following a fall with head injury and slurred speech. Computed tomography (CT) lower limb angiography revealed

severe peripheral vascular disease, still his infected toe was initially treated conservatively with antibiotics. Spread of the infection mandated an above-knee amputation. The stump healed well, so he was transferred to Rehabilitation Hospital Karin Grech (RHKG). A note was made in the discharge summary of a persistently raised white cell count (WCC) around 25 x 10^9/L despite the absence of any identifiable source of infection.

On admission to RHKG he developed pyrexia of 38.5^{0}C. No foci were evident, but blood cultures, complete blood count (CBC), renal profile, inflammatory markers were taken and he was started on intravenous co-amoxiclav and fluids. The white cell count (WCC) came back 18 x 10^9/L and C-reactive protein (CRP) was 184. Next day he was found lethargic and complained of dysuria. Gross pyuria was noted in addition to swelling of the penis and scrotum with acute pain of the right testicle. A good specimen of urine could not be collected. Working diagnosis of a urinary tract infection complicated by epididymo-orchitis was made, so intravenous co-amoxiclav was continued. At this stage, weary of provoking any trauma or septicaemia, it was decided against insertion of a urinary catheter. That evening he started getting fever spikes, whilst the nurses noted a discolouration of his external genitalia. The following day there was a dramatic deterioration in scrotal and penile swelling, with extensive bruising, skin breakdown and gangrenous changes (Figures 1 & 2).

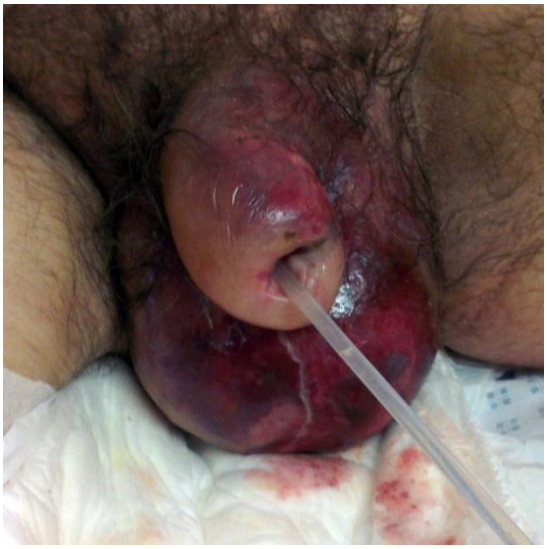

Fig. 1: Early changes of Fournier's gangrene in our patient.

At this point it became clear that the patient had developed Fournier's gangrene and a urinary catheter was inserted to manage fluid balance.

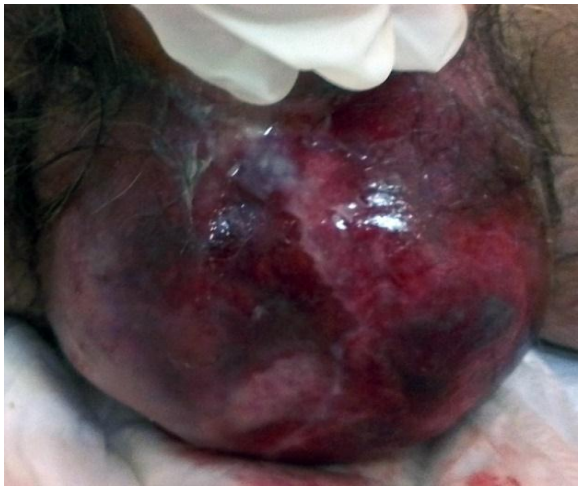

Fig. 2: Close up of generalised scrotal bruising and ecchymosis of varying density.

The team's clinical decision was for supportive therapy with antibiotics and analgesia, precluding any surgical involvement or any other proven therapy, on account of the patient's critical condition. Antibiotics were switched to intravenous (IV) piperacillin-tazobactam and metronidazole. Next of kin were made aware of his guarded prognosis and he was started on oral morphine syrup. The next day an area of maceration with bleeding on the shaft of the penis was noted, so his regular warfarin and aspirin were withdrawn and his treatment simplified. In line with palliation, the patient was started on morphine and metoclopramide via subcutaneous infusion. At this point his creatinine was 172µmol/L and WCC 20.10 x 10^9/L, with haemoglobin 7.4g/dL. Over the next few days the fever and pain subsided, but he incurred a negative fluid balance due to polyuria following the previous acute kidney injury, so the intravenous fluid rate was increased. Subsequently, the patient improved systemically although the area of gangrene remained markedly swollen.

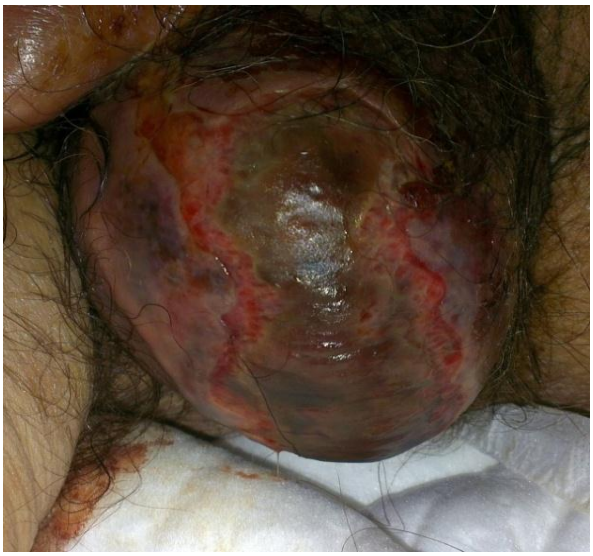

Fig.3: Early resolution and demarcation of necrotic areas.

Over the next few days genitalia swelling had markedly reduced, the CRP level fell to 53 and the gangrenous area developed a discrete demarcation, with granulation tissue forming and encroaching on the necrotic areas from viable tissue (Figure 3).

Prognostic optimism shifted focus onto nutritional status, yet he remained incapable of oral liquid nutritional supplementation due to repeated choking episodes. Nasogastric tube feeding was instituted at a slow rate, however the patient died unexpectedly that night. In view of his good clinical progress with aggressive antibiotic treatment, we feel surgical debridement could not have made any difference in outcome.

A CLINICAL LITERATURE REVIEW OF FOURNIER'S GANGRENE

Radiology

Fournier's gangrene is primarily a clinical diagnosis, but complete blood count, blood, urine and skin (wound) swab cultures and inflammatory markers such as C-reactive protein consolidate diagnosis and help assess severity.

Plain pelvic radiography is useful, however, computed tomography (CT) remains gold standard for diagnosing FG and is valuable in cases that are difficult to differentiate and additionally for identifying the extent of gangrene, anatomic spread of disease, presence of abscesses, fluid collection and subcutaneous emphysema, as well as monitoring during follow-up.[4] Apart from being more sensitive than ultrasound at picking up soft tissue thickening and inflammation and showing greater structural detail, CT reveals better gas within subcutaneous tissue, seen as a radiolucency, left in the wake of gas forming anaerobic organisms spearheading expansion of the infection front (subcutaneous emphysema) – a typical finding that occurs in 90% of FG cases.[4][19]

The role of surgical debridement

Early surgical debridement is necessary, with deep excision of all gangrenous tissue until only healthy, vitalised tissue remains. Nevertheless, care should be taken not to incise deep unaffected structures as this may foster further spread. Moreover, a full, comprehensive excision of all non-viable tissues may not be possible during the first intervention, leading to further surgeries. A study by Chawla et al shows that on average 3.5 operations *per capita* is required for full excision of necrotic areas.[8]

One large multi-centre study shows that out of 2,238 patients with a diagnosis of FG, 633 (or 28%) did not undergo surgical debridement, 36 of which eventually passed away. The remaining 597 were discharged without debridement.[3]

A recent, much smaller, retrospective study on 25 patients confirmed that early debridement and vacuum assisted therapy (negative pressure devices) of wounds, where applicable, ameliorated outcome and reduced the need for stoma insertion.[12] Other studies support these results, particularly where risk factors for adverse outcomes (diabetes mellitus, hepatic failure, immunosuppression, etc.) are present.[13]

Antimicrobial therapy

Predominant microorganisms include *Escherichia coli* (E. coli), Bacteroides and Streptococci. Others cultured include Staphylococci, Enterococci, Clostridia, Pseudomonas, Klebsiella and Proteus species.[4][5][6] Empirically, choice of a beta lactam would cover for Gram positive organisms, an aminoglycoside or third generation cephalosporin for Gram negative and coliforms, with metronidazole for its activity against anaerobic bacteria. An alternative regimen is ciprofloxacin and clindamicin. Clindamicin being highly regarded in the treatment of necrotising soft-tissue infections because of its' combined Gram-positive and anaerobic spectrum of activity. In animal models of streptococcal infection, response rates with clindamicin have surpassed both penicillin and erythromycin, even in the context of delayed treatment.[10]

Treatment must be tailored according to culture and sensitivity results, for instance vancomycin may be used to provide coverage for methicillin-resistant Staphylococcus aureus (MRSA). Contemporary studies yielded a 21% incidence of multi-drug resistant organisms (MDRO) in FG patients, with MRSA being commonest, followed by ESBL (extended spectrum β lactamase) positive E. coli, resistant Acinetobacter species and Gram-negative rods resistant to quinolones; presence of MDRO raised the probability of a negative outcome to 30% highlighting the importance of appropriate antibiotic choice.[15] If histopathological tissue stains reveal the presence of fungi, antifungal agents like Amphotericin B or caspofungin can be administered.

Topical therapy

Honey dressings have been used traditionally for gangrenous, necrotic wounds. Honey has three main wound healing properties:

- A low pH of 3.6, which discourages bacterial growth
- Phenolic acid, which has some specific antibacterial activity
- Enzymes that digest necrotic tissue

Studies have confirmed improved outcomes with use of honey dressings as adjuvant management in FG.[20][21][22]

Sodium hypochlorite (NaOCl) irrigation at a concentration of 0.025% has shown promise; this concentration offers a perfect balance between low toxicity to host tissue and adequate bactericidal action.[23] Dakin's solution – a chlorinated solution of sodium hydroxide and sodium carbonate – also received positive reviews, where its solvent action on necrotic tissue aided

the separation from viable tissue via chemical debridement.[24]

Faecal and urinary diversion

A colostomy allows diversion of faeces, reducing bacterial load on the affected area to improve wound healing, in the same way as a urinary catheter would prevent urinary soiling. The former naturally remains an exacting measure, compared to catheterisation which is a basic nursing procedure. Indications for the fashioning of a colostomy include: presence of continuous faecal contamination of the wound, FG involving the anal sphincter and faecal incontinence.[25] Studies have shown a higher mortality in FG cases requiring a colostomy[26], a significant confounding factor however was that stoma patients represented generally more severe, extensive or advanced disease, apart from the notorious stoma complications (dehiscence, evisceration, peri-stoma infection, necrosis and tissue breakdown). Conversely, benefits such as improved wound care, earlier oral intake and subsequent better nutritional status were established as advantageous.[27] Nevertheless, colostomies did not statistically reduce the number of debridement procedures necessary in the wider management scenario.

Flexi-weal faecal management system

This is a modified silicone catheter designed to divert faecal matter away from the 'nappy area' in cases such as FG, it thereby serves the same scope as a colostomy in limiting continuous inoculation of affected areas with colonic flora and reducing further skin breakdown. Flexi-weal systems may be an effective alternative to colostomy, circumventing the problems associated with stomas, even though rectal injuries, tumours and fistulas remain notable contraindications.[28]

Vacuum-Assisted Closure

Vacuum assisted closure (VAC) involves a sponge fashioned around the wound and sealed with occlusive dressing; suction tubing is then connected to this watertight compartment via an opening in the dressing that fits onto the tubing spout via an airtight seal. It allows drainage of fluid exudate whilst acting as a barrier against faecal soiling and has also been found to reduce the number of surgical debridement interventions.

Benefits at a microscopic level include:

- Promoting neovascularisation (accumulation of angiogenic/ growth factors)
- Enhancing migration of white blood cells to the area (attracted by the local accumulation of cytokines)
- Increased local blood flow
- Stimulate granulation tissue formation (accumulation of growth factors)
- Reduction of bacterial load

Simplified forms, such as connecting separate wounds with foam bridges along which a Penrose drain is drawn to a single vacuum pump, has yielded success.[29]

A study applied VAC to six FG patients immediately following necrosectomy reduced hospital stays, patient discomfort and number of medications, as opposed to conventional therapy, thereby leading to a better outcome.[30] Comparing use of VAC therapy to conventional care (debridement and saline soaked gauze), in the VAC cohort the mean duration until complete wound closure was of 38.9 days when compared with 69.8 days for the conventionally managed cohort, without local recurrence in the VAC group upon follow-up.[31]

Hyperbaric Oxygen

Adjunct Hyperbaric Oxygen Therapy (HBOT) has also been used to treat FG and studies have established its efficacy and decrease in mortality. HBOT is known to exert beneficial effects by means of angiogenesis, fibroblast proliferation, vasoconstriction whilst boosting antibiotic activity.[32]

Prognosis

Early reports showed a mortality rate of around 80%. Contemporary studies demonstrate that improvements have resulted in lower mortality rates ranging from 11 to 45%. Anorectal sources of infection generally present the highest mortality rates.[5]

In a retrospective analysis of 1,726 confirmed cases ranging from the year 1950 to 1999 across the globe, a 16% mortality rate was found; another unpublished study of 3,297 Fournier's gangrene cases spanning from 1950 to 2007 yielded an even higher mortality rate at 21.1%.[1][9] These figures are corroborated by a recent study concluded in December 2014, yielding a 17% mortality rate[17], whilst another Korean study in 2015 demonstrated a 25% mortality.[13]

CONCLUSION

FG being a life-threatening disease solicits aggressive treatment including extensive use of antibiotics and surgical debridement, if tolerated. We feel that our case presentation is unique in that a palliative care approach to FG with a frail patient very nearly achieved cure without surgical debridement or other measures, as attested by the encouraging clinical course, notwithstanding his sudden demise.

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REFERENCES

1. Mallikarjuna M. N., Abhishek Vijayakumar, Vijayraj S. Patil, and B. S. Shivswamy, "Fournier's Gangrene: Current Practices," ISRN Surgery, Article ID 942437, 2012; 8. 2012. doi:10.5402/2012/942437
2. Thwaini A, Khan A, Malik A, Cherian J, Barua J, Shergill I. Fournier's gangrene and its emergency

management, Postgrad Med J., 2006; 82(970): 516-519.
3. Sorensen MD, Krieger JN, Rivara FP, Broghammer JA, Klein MB, Mack CD, Wessells H. Fournier's gangrene: population epidemiology and outcomes. J Urol, 2009; 181: 2120–2126.
4. Levenson R., Singh A, Novelline R, Fournier Gangrene: Role of Imaging. Radio Graphics, 2008; 28: 519-528.
5. Koukouras D, Kallidonis P, Panagoupoulos C, Al-Aown A, Athanasopoulos A, Rigopoulos C, Fokaefs E, Stolzenburg JU, Perimenis P, Liatsikos E: Fournier's Gangrene, a Urologic and Surgical Emergency: Presentation of a Multi-Institutional Experience with 45 cases. Urologia Internationalis, 2011; 86(2): 167-172.
6. Talwar A, Puri N, Singh M. Fournier's gangrene of the penis: A rare entity. J Cutan Aesthetic Surg, 2010; 3(1): 41-4.
7. Roje Z, Matic D, Librenjak D, Dukozovic S, Varvodic J. Necrotizing fasciitis: literature review of contemporary strategies for diagnosing and management with three case reports: torso, abdominal wall, upper and lower limbs. World Journal of Emergency Surgery, 2011; 6(1): 46.
8. Chawla SN, Gallop C, Mydlo JH. Fournier's gangrene: an analysis of repeated surgical debridement. Eur Urol, 2003; 43: 572–5.
9. N. Eke, "Fournier's gangrene: a review of 1726 cases". British Journal of Surgery, 2000; 87(6): 718–728.
10. Stevens DL, Gibbons AE, Bergstrom R, Winn V, "The Eagle effect revisited: efficacy of clindamycin, erythromycin, and penicillin in the treatment of streptococcal myositis," J Infect Dis., Jul, 1988; 158(1): 23-8.
11. Fukuhisa H, Baba K, Kita Y, Tanabe H, Ijichi T, Mori S, Natsugoe S, "A Case of Fournier's Gangrene Due to Perforation of Lower Rectal Cancer during Chemotherapy". Gan To Kagaku Ryoho, Oct, 2017; 44(10): 935-937.
12. Yücel M, Özpek A, Başak F, Kılıç A, Ünal E, Yüksekdağ S, Acar A, Baş G. "Fournier's gangrene: A retrospective analysis of 25 patients". Ulus Travma Acil Cerrahi Derg, Sep, 2017; 23(5): 400-404. doi: 10.5505/tjtes.2017.01678.
13. Hong KS, Yi HJ, Lee RA, Kim KH, Chung SS. "Prognostic factors and treatment outcomes for patients with Fournier's gangrene: a retrospective study". Int Wound J., 2017 Sep 25. doi: 10.1111/iwj.12812.
14. Jiwrajka M, Pratap K, Yaxley W, Dunglison N. "Result of Health Illiteracy and Cultural Stigma: Fournier's Gangrene, a Urological Emergency". BMJ Case Rep., Oct 19, 2017; 2017. pii: bcr-2017-220836. doi: 10.1136/bcr-2017-220836.
15. Chia L, Crum-Cianflone NF. "Emergence of multi-drug resistant organisms (MDROs) causing Fournier's gangrene". J Infect. 2017 Sep 28. pii: S0163-4453(17)30307-9. doi: 10.1016/j.jinf.2017.09.015.
16. Tenório CEL, Lima SVC, Albuquerque AV, Cavalcanti MP, Teles F. "Risk factors for mortality in fournier's gangrene in a general hospital: use of simplified fournier gangrene severe index score (SFGSI)". Int Braz J Urol, Aug 30, 2017; 43. doi: 10.1590/S1677-5538.IBJU.2017.0193
17. Tarchouli M, Bounaim A, Essarghini M, Ratbi MB, Belhamidi MS, Bensal A, Zemmouri A, Ali AA, Sair K. "Analysis of prognostic factors affecting mortality in Fournier's gangrene: A study of 72 cases". Can Urol Assoc J., Nov-Dec, 2015; 9(11-12): E800-4. doi: 10.5489/cuaj.3192. Epub 2015 Nov 4.
18. Oymacı E, Coşkun A, Yakan S, Erkan N, Uçar AD, Yıldırım M. "Evaluation of factors affecting mortality in Fournier's Gangrene: Retrospective clinical study of sixteen cases". Ulus Cerrahi Derg, Jun 1, 2014; 30(2): 85-9. doi: 10.5152/UCD.2014.2512. eCollection 2014.
19. J. Sherman, M. Solliday, E. Paraiso, J. Becker, and J. H. Mydlo, "Early CT findings of Fournier's gangrene in a healthy male," Clinical Imaging, 1998; 22(6): 425–427.
20. M. Subrahmanyam, S. P. Ugane. "Honey dressing beneficial in treatment of Fournier's gangrene". Indian Journal of Surgery, Mar-Apr, 2004; 66(2): 75-77.
21. Haidari M, Nazer MR, Ahmadinejad M, Almasi V, Khorramabadi MS, Pournia Y. "Honey in the treatment of Fournier's gangrene as an adjuvant: a cross sectional study". Journal of Pakistan Medical Association, May 2014; 64(5): 571-3.
22. Tahmaz L, Erdemir F, Kibar Y, Cosar A, Yalcyn O. "Fournier's gangrene: report of thirty-three cases and a review of the literature". Int J Urol, Jul, 2006; 13(7): 960-7.
23. J. P. Heggers, J. A. Sazy, B. D. Stenberg et al., "Bactericidal and wound-healing properties of sodium hypochlorite solutions: the 1991 Lindberg Award," Journal of Burn Care and Rehabilitation, 1991; 12(5): 420–4: 1991.
24. B. Altunoluk, S. Resim, E. Efe, et al., "Fournier's gangrene: conventional dressings versus dressings with Dakin's solution," ISRN Urology, vol. 2012, Article ID 762340, 4 pages, 2012.
25. A. T. Corcoran, M. C. Smaldone, E. P. Gibbons, T. J. Walsh, and B. J. Davies, "Validation of the Fournier's gangrene severity index in a large contemporary series," Journal of Urology, 2008; 180(3): 944–948.
26. B. Erol, A. Tuncel, V. Hanci et al., "Fournier's gangrene: overview of prognostic factors and definition of new prognostic parameter," Urology, 2010; 75(5): 1193–1198.
27. A. Akcan, E. Sözüer, H. Akyildiz, N. Yilmaz, C. Küçük, and E. Ok, "Necessity of preventive colostomy for Fournier's gangrene of the anorectal region," Ulusal Travma ve Acil Cerrahi Dergisi, 2009; 15(4): 342–346.

28. O. Estrada, I. Martinez, M. Del Bas, S. Salvans, and L. A. Hidalgo, "Rectal diversion without colostomy in Fournier's gangrene," Techniques in Coloproctology, 2009; 13(2): 157–159.
29. Pryor R III, Sparks D, Chase D, Bogen G. "Wound VAC for Fournier's gangrene: a new technique for applying a vacuum-assisted closure device on multiple wound sites using minimal connectors," OPUS 12 scientist, 2009; 3: 3.
30. Assenza M, Cozza V, Sacco E, Clementi I, Tarantino B, Passafiume F, Valesini L, Bartolucci P, Modini C. "VAC (Vacuum Assisted Closure) treatment in Fournier's gangrene: personal experience and literature review," Clin Ter., 2011; 162(1): e1-5.
31. Denzinger S, Lübke L, Roessler W, Wieland WF, Kessler S, Burger M., Department of Urology, Caritas Krankenhaus St. Josef, University of Regensburg, Landshuterstrasse 65, 93053 Regensburg, Germany. "Vacuum-assisted closure versus conventional wound care in the treatment of wound failures following inguinal lymphadenectomy for penile cancer: a retrospective study," Eur Urol., 2007 May; 51(5): 1320-5. Epub 2006 Dec 22.
32. Bhutani S, Vishwanath G. Hyperbaric oxygen and wound healing. Indian J Plast Surg, 2012; 45(2): 316–324.