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Case Report

Novel Use of Ultrasound-Guided 5% Dextrose Hydrodissection in a Case of Chronic Upper Limb Fibrosis after Docetaxel Extravasation

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How To Cite: Lakkaraju, A. Novel Use of Ultrasound-Guided 5% Dextrose Hydrodissection in a Case of Chronic Upper Limb Fibrosis after Docetaxel Extravasation. *Australian Journal of Oncology* **2026**, *1*(1), 4.

Received: 8 March 2026
Revised: 17 May 2026
Accepted: 20 May 2026
Published: 9 June 2026

Abstract: Chemotherapy agent extravasation is a recognised complication of intravenous administration of antineoplastic therapy. This can result in persistent soft tissue injury, resulting in chronic pain and functional impairment. While acute management of chemotherapeutic agent extravasation is well described, there is limited literature addressing interventional options for patients who develop long-term chronic pain and functional impairment following extravasation. *Case Summary*: We describe a case of a 69-year-old patient with prostate cancer who attended our interventional pain clinic 6 months after extravasation of a 50 mL of intravenously administered Docetaxel into the soft tissues of the left forearm. The patient had tried conservative measures with no improvement. He presented with left forearm chronic pain, sensory deficit from mid biceps to left thumb, loss of fine motor skills, restriction of movement at elbow and wrist, and moderate left forearm lymphoedema. His ultrasound revealed diffuse deep fascial thickening and perineural fibrosis, most pronounced around the radial and ulnar nerves of the left forearm. Seven sessions of ultrasound-guided dextrose hydrodissection (DH) to areas of neural impingement and myofascial fibrosis was performed in the forearm. Each session was followed by manual fascial manipulation and manual lymphatic drainage. This resulted in near complete resolution of numbness, a return to the normal range of movement of the wrist and elbow, and a return of normal fine motor skills. His lymphoedema resolved, resulting in a drop in size of his compression garment after treatment. *Conclusion*: This case highlights the potential role of ultrasound-guided neural and fascial DH as a safe and effective interventional option for chronic fibrosis after Taxel chemotherapy extravasation.

Keywords: docetaxel; chemotherapy extravasation; chronic fibrosis; prolotherapy; nerve hydrodissection; regenerative treatments; interventional pain

1. Introduction

Chemotherapy extravasation occurs when there is an inadvertent leakage of intravenously injected cytotoxic agent into surrounding tissues. The reported incidence varies from 0.1% to 6% depending on the infusion technique and vascular access device used, but remains a significant complication of cancer therapy [1–3]. Both vesicant and irritant chemotherapy agents may cause tissue necrosis, leading to fibrosis and producing long-term morbidity if not promptly recognised and managed [4–7]. Acute management includes aspiration, antidote administration, limb elevation, temperature modulation, and compression bandaging [2,6]. Despite these measures, some patients develop persistent pain, stiffness, and functional impairment long after the acute injury has resolved [5–8]. Neurological sequelae are commonly seen after Taxane extravasation. These chronic sequelae are under-represented in the literature and often lack clearly defined treatment pathways.

Interventional pain techniques have not been routinely explored in this context. Neural and myofascial DH, an ultrasound guided interventional pain technique has been used in chronic myofascial pain, scar release and neuropathy. This case report offers a novel approach to addressing chemotherapy extravasation-induced soft tissue fibrosis [9–11].

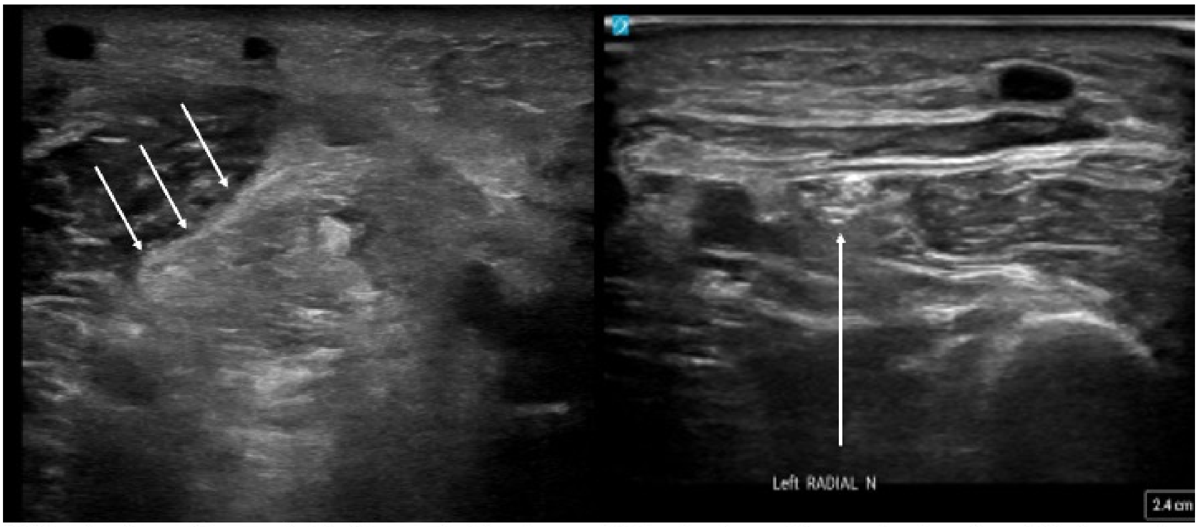
2. Case Report

A 69-year-old male with prostate cancer presented to our clinic with left forearm symptoms 6 months after extravasation of 50 mL of intravenously administered Docetaxel. Following development of bullous dermatitis, normal skin regrowth was seen (Figure 1). He had persistent symptoms of chronic pain, numbness from the biceps to the left thumb region, and restriction of range of movement of the thumb, wrist, and elbow. He was unable to perform fine motor skills such as buttoning up his shirt or holding a pen. He also had left forearm moderate lymphoedema. The plastic surgery team deemed surgery unnecessary. Despite being managed conservatively with regular manual lymphatic drainage and compression stockings, he continued to have significant chronic pain and dysfunction with a Numerical Pain Score (NPS) of 7/10.

Figure 1. Images of the left forearm immediately (**a**); 4 weeks (**b**) after extravasation and at presentation (**c**).

On examination, he had a mildly swollen left forearm with normal skin texture (Figure 1) but had hypoaesthesia and paraesthesia throughout the left forearm and lower third of the arm in the ulnar and radial nerve distribution. No significant motor loss was elicited. He showed restricted pronation from 0–40° (normal pronation 0–80°) and supination from 0–30° (0–80°). Elbow and wrist flexion-extension were also reduced. We performed the "scratch-collapse test", which demonstrated impingement of the radial nerve at the level of the inferior radial groove and impingement of the ulnar nerve in the proximal forearm. His QuickDASH score for upper limb functional disability was measured at 68 [12].

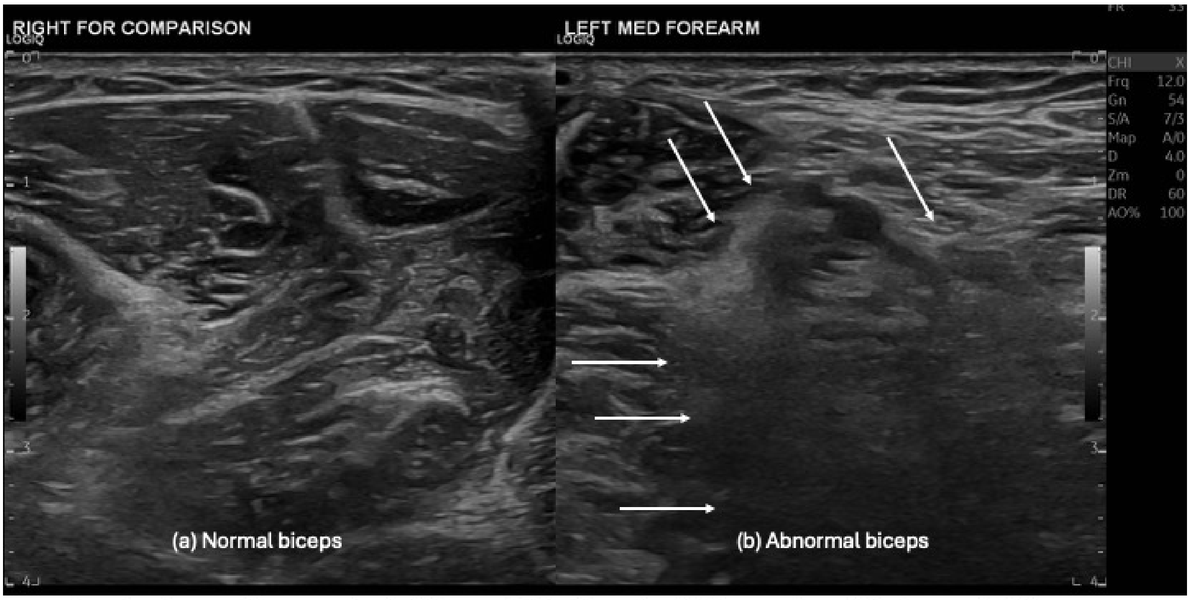
Ultrasound evaluation of the left forearm was performed on a GE Totus ultrasound machine (GE Medical Systems, CA, USA). Ultrasound evaluation demonstrated diffuse thickening of the deep fascia over the extensor and flexor compartments, most thickened in the region of the cubital fossa involving the distal biceps tendon (Figure 2). Perineural fibrosis was seen around the median nerve (Figure 3). Perineural fibrosis surrounding the radial nerve was noted as it exited the radial groove. Ulnar nerve fibrotic impingement was identified between the two heads of the flexor carpi ulnaris. Impingement of the cutaneous nerves of the forearm was also visualised (Figure 3). Finally, diffuse intramuscular and intermuscular fibrosis was identified (Figures 2 and 3). Strain sonoelastography mapping was used to confirm increased soft tissue stiffness and abnormal stiffness of the nerves (Figures 4 and 5), a surrogate marker of myofascial fibrosis.



(a) B-mode ultrasound images showing intramuscular fibrosis within the Brachialis Muscle

(b) B-mode ultrasound images showing perineural fibrosis around the median nerve

Figure 2. Ultrasound images of left forearm showing (**a**) diffuse fibrosis of fascia and (**b**) perineural fibrosis around the radial nerve just inferior to the radial groove.



B-mode ultrasound images showing (a) ***normal*** right biceps brachialis muscle and (b) ***abnormal*** left biceps brachialis muscle demonstrating intramuscular fibrosis within the muscle (arrows shows fibrosis)

Figure 3. B-mode ultrasound images showing normal right biceps brachialis muscle and abnormal left biceps brachialis muscle demonstrating intramuscular fibrosis within the muscle (arrows shows fibrosis).

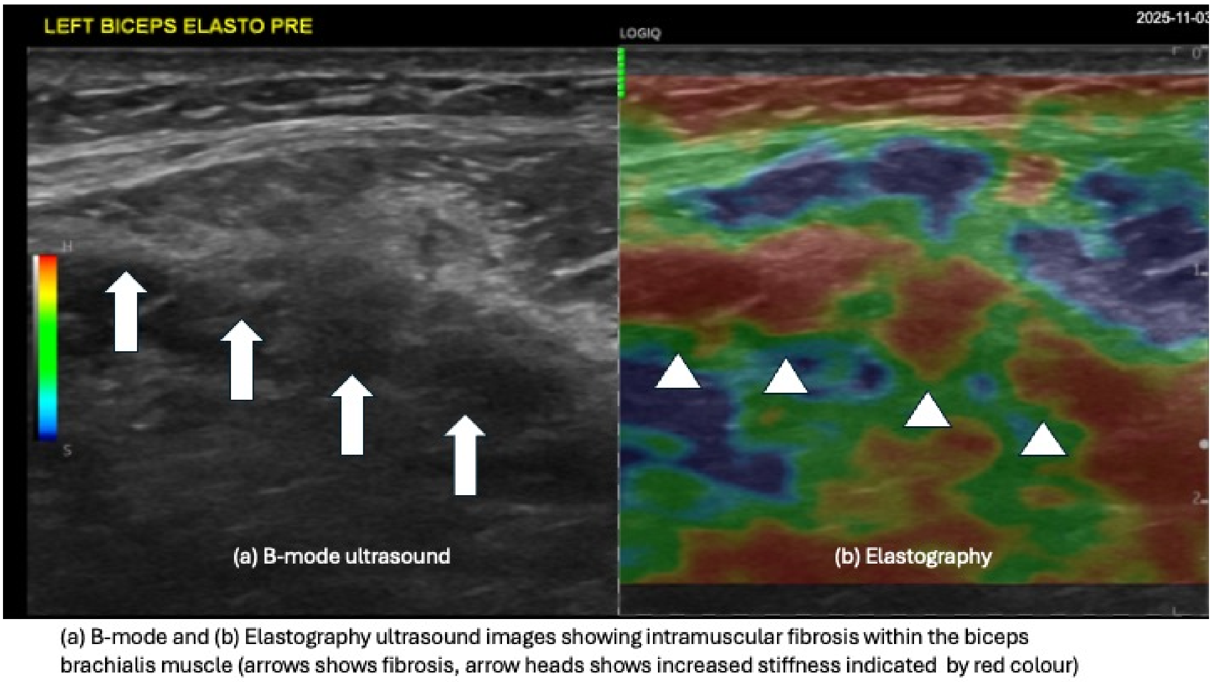


Figure 4. (**a**) B-mode ultrasound and (**b**) elastography map demonstrating fibrosis intramuscular fibrosis of the biceps muscle belly. Arrows demonstrate intramuscular fibrosis on B-mode. The arrow heads show increased tissue stiffness denoted by red markings on the elastography in the region of fibrosis.

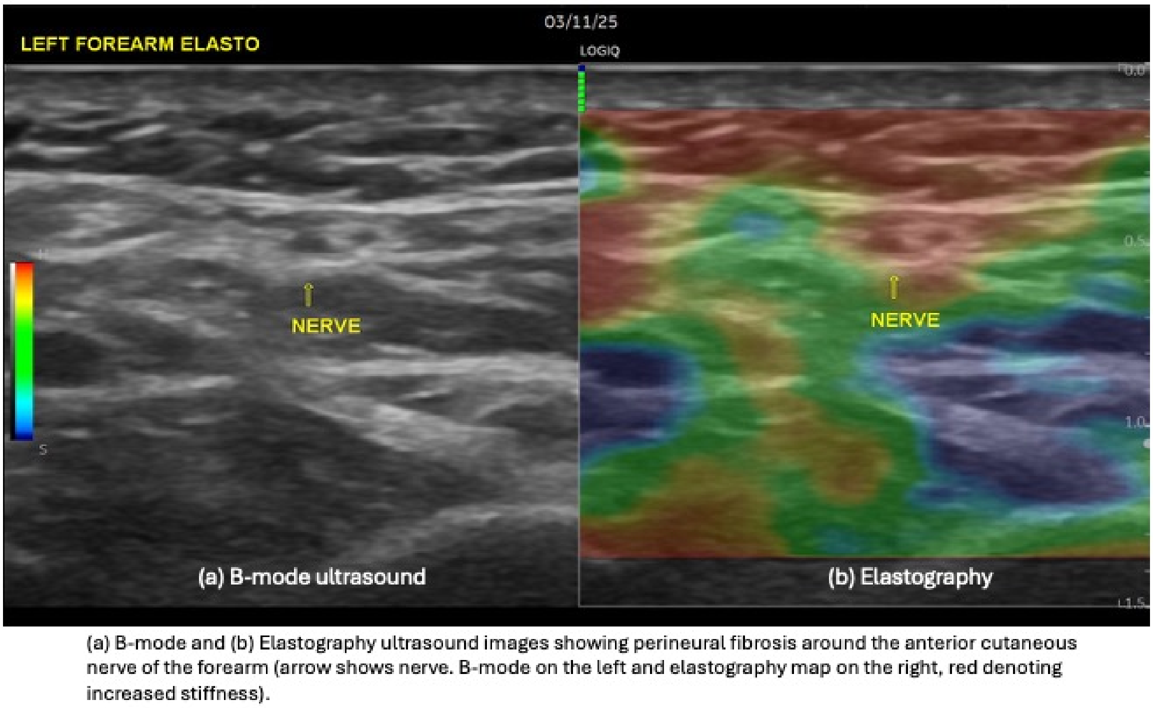
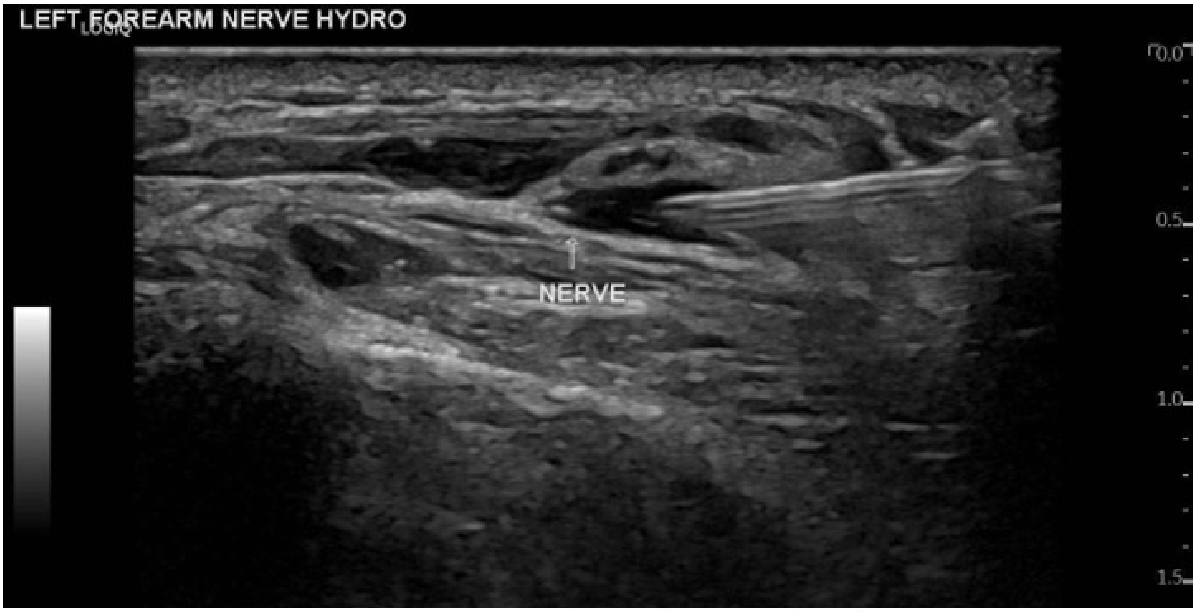


Figure 5. Perineural fibrosis seen around the anterior cutaneous nerve of the forearm with elastography demonstrating increased stiffness.

The patient underwent a total of seven ultrasound-guided DH sessions, each session performed every three weeks, to release myofascial fibrosis and areas of neural impingement. The 5% dextrose solution was prepared in a 10 mL syringe by diluting 8 mL of 50% dextrose with 1 mL of 0.2% Ropivacaine (Naropin, Astrazeneca, Cambridge, UK) and 1 mL of 8.4% Sodium bicarbonate. A 10 mL syringe with a 27 G needle containing this dextrose solution was injected under ultrasound guidance using a ML 6–15 Linear matrix array probe (GE Medical Systems, Wauwatosa, WI, USA). The radial and ulnar nerves were identified at the sites of impingement on ultrasound and careful ultrasound guided hydrodissection was carried out to release the fibrotic impingement of the nerves (see Figure 6). Additionally, ultrasound-guided DH was performed at the areas of maximum fibrosis around the flexor and extensor compartments, as well as around the biceps brachii tendon and the extensor tendons. A week after each DH session, manual myofascial release and manual lymphatic drainage was performed along the forearm from distal to proximal by an experienced lymphatic practitioner.



B-mode ultrasound images showing ultrasound guided neural hydrodissection of the fibrosed anterior cutaneous nerve of the forearm.

Figure 6. B-mode ultrasound images showing ultrasound guided neural hydrodissection of the fibrosed anterior cutaneous nerve of the forearm.

After 3 sessions of ultrasound-guided DH, the patient reported having regained approximately 50 percent of his sensation and had improved his range of motion to 50° of both supination and pronation. His wrist and elbow flexion had returned to normal, although there remained a 5° of extension lag at the elbow. His pain score had reduced to 2/10 and his QuickDASH score had dropped to 22/10 from 68/100. Following a further 4 sessions of DH, the sensation in his thumb had normalised, supination and pronation of the forearm were at 70°, but elbow extension restriction remained unchanged. Functionally, he felt he was back to normal and found his fine motor skills had returned. His QuickDASH score had further reduced to 4/100 with minor area of tingling in the medial elbow. His pain score was now 0–1/10.

3. Discussion

Chemotherapy extravasation is associated with a spectrum of tissue injury ranging from mild inflammation to severe necrosis, depending on the cytotoxic properties of the agent involved [1–3]. Docetaxel has mixed vesicant and irritant properties. Extravasation of Docetaxel is more likely to occur when administered through peripheral venous access. The long-term effects of Docetaxel extravasation include peripheral neuropathy and chronic pain [13–15]. This is due to their effects on microtubule stabilisation, which is responsible for a proinflammatory and profibroblastic effect [16–18].

The ultrasound findings in this case show perineural fibrosis of multiple nerves in the left arm, fibrosis being most involved around the cubital fossa, where the intravenous cannula was sited, and where extravasation occurred. Diffuse fibrosis involving the deep fascia, intermuscular and intramuscular fascial septae also followed a similar pattern, most concentrated around the cubital fossa. The literature on imaging findings after extravasation is sparse. One case report describes skin induration on B-mode and elastography six months after Paclitaxel extravasation [19]. To our knowledge, this is the first case report to detail the ultrasound and elastography findings of chronic Taxane extravasation injury to the fascia, nerves and muscles.

Acute management of extravasation has been well described, including specific measures for Docetaxel extravasation [6,8,20]. Management of chronic taxane-induced fibrosis is largely extrapolated from other chemo-radiotherapy induced fibrotic and entrapment conditions. Therapy typically combines physiotherapy, manual fascial release and lymphatic drainage. Chronic pain and peripheral neuropathy after taxanes have been managed with Duloxetine and anti-epileptic. Management of chemotherapy induced fibrosis has been through injection of Hyaluronidase in the acute setting, Vitamin E and pentoxyphilline in more chronic cases [20–22]. In the setting of extravasation and chronic necrotic hypodermic tissue, open surgical debridement and use of maggots has been described [23].

Dextrose is a proliferative solution that stimulates a localized inflammatory response and promote tissue repair [9,10]. It has demonstrated benefit in a range of chronic musculoskeletal conditions including tendinopathy, ligament injury and myofascial dysfunction. DH works by producing a low-grade pro-inflammatory regenerative action, downregulating substance P and mechanically releasing tissues through the action of hydrostatic presure [10,11,24,25]. There is an emerging role in nerve impingement where DH can be used to release the trapped nerve and reduce pain [11,25–28]. While no prior studies have specifically evaluated DH for chemotherapy induced fibrosis, its established safety profile and regenerative rationale supports its use in this case. In the setting of neural hydrodissection, ultrasound guidance is imperative for accurate injection placement, safety and efficacy of treatment [27].

To our knowledge, this is the first reported case describing ultrasound-guided DH for chronic pain following chemotherapy extravasation. This case expands the conceptual framework of extravasation injuries from an acute oncologic complication to a potential source of chronic, treatable pain.

As cancer survivorship increases, recognition and management of long-term treatment-related pain conditions will become increasingly important [29]. There is already interest in stem cell treatments for chronic radiation fibrosis [21,22]. This Interventional regenerative approach may represent a valuable, low-cost and easily available addition to chemo-radiotherapy induced fibrosis.

This report is limited by its anecdotal nature. Optimal DH protocols for this indication—including solution concentration, injection frequency, and target tissues—remain undefined.

Future research should include prospective case series and comparative studies evaluating interventional strategies for chronic extravasation-related pain, ideally incorporating functional and patient-reported outcome measures.

4. Conclusions

Chronic pain following chemotherapy extravasation is an underrecognized clinical entity with limited evidence-based treatment options [7,8]. This case report details the ultrasound findings of chronic soft tissue changes after Taxane extravasation which correlate with the reported histological changes observed in the literature. To our knowledge, this is the first reported case of ultrasound guided DH use in chemotherapy extravasation induced fibrosis. Further investigation is warranted to clarify its role within interventional pain medicine and in cancer survivorship care.

Funding

This research received no external funding.

Institutional Review Board Statement

Ethical review approval was waived for this study as this was a case study.

Informed Consent Statement

Written informed consent has been obtained from the patient to publish this paper.

Conflicts of Interest

The author declares no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work the author used Grammarly in order to check spelling and context of the article. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the published article.

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