Al-Kunooze Scientific Journal
e-ISSN: 2706-6223
P-ISSN: 2706-6231
https://www.asj.kunoozu.edu.iq/
2026, 12(3):79-102

Fracture, Retention, Migration, and Retrieval of Peripheral Intravenous Cannula Fragments: A Systematic Review of Published Case Reports and Small Case Series

Pavel Mustafa Kareem[1]*, Irfan Omer Ali[1], Bashir Mohammed Rasul[2,3], Muhammad Ahmad Khdr[2], Paiwand Jamal Hassan[1]

[1] Nursing Department, Kurdistan Technical Institute, Sulaimani, Kurdistan Region, Iraq

[2] Department of Adult Nursing, College of Nursing, University of Raparin, Ranya, Sulaymaniyah, Iraq

[3] Colleges of Nursing, University of Human Development, Sulaymaniyah, Iraq

***Corresponding Author** Email: Pavelmustafa20@gmail.com

- Receive Date **02 April 2026** Revise Date **11 April 2026**
- Accept Date **17 April 2026** Publish Date **01 July 2026**

https://doi.org/10.36582/ksj.2026.170548.1039

Abstract

This study was designed as a systematic review of published case reports and small case series. Study selection and reporting were structured in accordance with PRISMA 2020 and PRISMA-S. Findings were synthesized narratively in line with SWiM, and the full reproducible search strategies are provided in Supplementary File 1. The reproducible PubMed/MEDLINE search identified 21 records, of which 14 publications comprising 20 individual patients were included in the qualitative synthesis. The literature spanned 1992 to 2025, and 9 of the 14 publications (64.3%) were published from 2020 onward. Cases ranged from a day-old neonate to a 76-year-old adult. Events arose predominantly from upper-extremity peripheral venous access and were commonly associated with repeated cannulation attempts, reinsertion of the introducer needle into a partially advanced cannula, device manipulation, or difficult removal. Fragments were usually retained within superficial upper-limb veins, although central embolization to the pulmonary artery or heart/great vessels was documented in 2 of 20 patients (10.0%). Ultrasound and computed tomography were the most informative localization modalities when radiography was negative or inconclusive. Management was predominantly active retrieval, and favorable short-term outcomes were reported in 18 of 20 patients (90.0%). The available case-based evidence suggests that fractured PIVC fragments should be approached as time-sensitive intravascular foreign bodies. These findings support a practical strategy focused on avoiding needle reinsertion and repeated manipulation of the same cannula, together with prompt containment, imaging-based localization, and anatomy-directed retrieval, while recognizing that comparative effectiveness cannot be established from the current literature. Peripheral intravenous cannula; peripheral intravenous catheter; catheter fracture; retained intravascular foreign body; cannula embolization; venotomy; endovascular retrieval; systematic review.

Keywords: Peripheral venous cannula; peripheral venous catheter; catheter fracture; retained intravascular foreign body; cannula bolism;

Published by: Al-Kunooze University, Basrah, Iraq

Introduction

Peripheral intravenous catheters (PIVCs) are fundamental to contemporary hospital care and remain the most frequently used invasive device in routine clinical practice [1]. Their ubiquity is substantial; a recent systematic review and meta-analysis noted that more than two billion PIVCs are used globally each year, underscoring the scale at which even low-frequency complications may translate into a considerable absolute clinical burden [1]. Because PIVCs are inserted across emergency, medical, surgical, and pediatric settings, they are often perceived as simple and low-risk devices. However, this perception may obscure the fact that peripheral venous access is not a benign intervention, particularly when device failure interrupts treatment, necessitates reinsertion, or precipitates downstream complications [1-2].

The broader literature on PIVC outcomes confirms that catheter-related complications are common and clinically important. In the largest recent synthesis, Marsh et al. analyzed 69 studies comprising 478,586 PIVCs and reported that all-cause PIVC failure before completion of therapy occurred in 36.4% of catheters, equivalent to approximately one in three devices [1]. In a complementary systematic review focused on non-infectious complications in adults, the same research group found that phlebitis, infiltration/extravasation, occlusion, leakage, pain, and dislodgement occurred at appreciable rates, with phlebitis reported in 19.3% of catheters when explicitly defined and infiltration/extravasation in 13.7% [2]. Importantly, these events are not merely technical inconveniences. Analysis of 588,375 qualifying hospital admissions in the United States showed that patients with peripheral intravenous-related complications had a longer adjusted mean hospital stay, higher hospitalization costs, lower likelihood of discharge home, and a higher risk of death than those without such complications [3]. Collectively, these data establish that complications associated with peripheral venous access carry meaningful consequences for patients, clinicians, and health systems.

Against this background of frequent overall PIVC failure, fracture of the peripheral intravenous cannula with retention, migration, or embolization of a fragment represents a distinctly uncommon but potentially serious event. Published case literature consistently characterizes this complication as rare, underreported, and potentially devastating [4-6]. Nyamuryekung'e et al. described fracture of a peripheral intravenous cannula in situ as a rare but potentially serious complication whose etiology and prevention are not widely

recognized by clinicians performing cannulation [4]. Similarly, Kumar and Ranjan emphasized that iatrogenic fracture with proximal migration is an extremely rare and underreported complication that may behave as a retained intravascular foreign body with lethal consequences [5]. In pediatric practice, Pu et al. recently reiterated the rarity of catheter fracture and highlighted that migration of retained fragments may result in pulmonary embolism or cardiac arrhythmias, while also noting that PIVC fractures appear underreported despite the widespread use of these devices [8].

The clinical significance of this event lies not only in its rarity but also in the nature of the complications that may follow delayed recognition or failed containment of the fragment. Retained cannula segments can function as intravascular foreign bodies and may migrate proximally, leading to local vascular injury or more distant embolic phenomena [5-6]. Reported and postulated sequelae in the literature include sepsis, dysrhythmia, myocardial infarction, pulmonary embolism, and other severe consequences related to embolization or intravascular retention [4-5; 8]. Although not every case progresses to a major adverse event, the possibility of rapid migration means that fracture of a PIVC should be viewed as a time-sensitive complication that requires prompt clinical suspicion, localization, and management [5; 7-8].

Another important concern is that the mechanisms, preventive lessons, and management pathways for fractured PIVCs are not consolidated in one easily accessible body of evidence. Case reports have implicated potentially avoidable procedural factors such as reinsertion of the introducer needle into the plastic cannula, repeated insertion attempts with the same device, excessive manipulation, patient agitation or self-removal, and delayed recognition of the missing fragment [4; 6; 8]. Once a fracture is suspected, the published literature describes the use of physical containment measures, bedside ultrasonography, radiological localization, venotomy, open surgical exploration, and, in selected circumstances, other retrieval strategies [4-5; 7-8]. Nevertheless, Isiguzo et al., in a case series of six adult patients, specifically noted a paucity of well-defined retrieval techniques in the literature, emphasizing that management knowledge remains fragmented and largely experience-based [7].

This fragmentation is reflected in the structure of the existing evidence base. Unlike the extensive literature on infection, phlebitis, infiltration, and overall catheter failure, reports dealing specifically with broken peripheral intravenous cannulas are scattered across case reports and small case series in surgical, emergency, radiological, and pediatric journals [1-2; 4-8]. As a result, clinicians confronted with a retained or embolized cannula fragment may have limited access to a synthesized overview of the typical clinical settings, risk factors, anatomical locations, diagnostic work-up, retrieval techniques, and outcomes reported in prior cases. For a rare adverse event, this lack of synthesis can hinder both recognition and standardization of management.

Accordingly, the present review was undertaken to provide a comprehensive

synthesis of published case reports and case series involving fractured, retained, migrated, or embolized peripheral intravenous cannula fragments, with particular attention to the circumstances of fracture, localization strategies, management approaches, and patient outcomes. By consolidating the dispersed case-based literature, the review clarifies the clinical spectrum of this complication, identifies recurring procedural and contextual themes, and provides a practical evidence base for clinicians managing retained or migrated peripheral intravenous cannula fragments.

Materials and Methods

Review Design and Reporting Framework

This study was designed as a systematic review of published case reports and small case series describing fracture, breakage, retention, migration, or embolization of peripheral intravenous cannula fragments and the diagnostic and management approaches used after these events. The methodological structure and reporting framework were developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020), which provides the current core guidance for transparent reporting of systematic reviews [9]. The reporting of the electronic search strategy was aligned with PRISMA-S, the dedicated extension for literature search reporting in systematic reviews [10]. Because the available evidence in this topic consists predominantly of descriptive reports of rare adverse events with marked clinical heterogeneity, the synthesis was narrative rather than quantitative and was structured in line with the Synthesis Without Meta-analysis (SWiM) reporting guidance where applicable [11].

Review Question and Objectives

The review addressed the following question: What are the reported clinical characteristics, diagnostic pathways, management strategies, and outcomes of published incidents involving a broken or retained fragment of a peripheral intravenous cannula? The primary objective was to identify and synthesize all published patient-level reports of peripheral intravenous cannula fracture. The secondary objectives were to summarize the circumstances of fracture, the anatomical location of retained or migrated fragments, the imaging modalities used for localization, the techniques used for retrieval or

conservative management, and the outcomes reported after intervention.

Eligibility Criteria

The eligibility criteria were defined a priori for descriptive clinical evidence. Eligible reports were full-text human case reports or small case series published in peer-reviewed journals that described a fractured, broken, transected, separated, retained, migrated, or embolized fragment of a peripheral intravenous cannula. Studies involving either adult or pediatric patients were considered eligible. To be included, a report had to provide patient-level clinical information on at least one of the following domains: the mechanism or context of cannula fracture, the site of cannulation, the location of the retained fragment, the diagnostic or imaging work-up, the retrieval or management approach, or the clinical outcome.

The review excluded narrative reviews, systematic reviews, editorials, comments, conference abstracts without sufficient patient-level information, technical notes without a clinical case, animal studies, and reports involving devices outside the scope of peripheral intravenous cannulation, including central venous catheters, hemodialysis catheters, peripherally inserted central catheters, implantable venous access ports, epidural catheters, and arterial catheters. When an article described a mixed device population, it was considered eligible only if the peripheral intravenous cannula cases were clearly identifiable at the individual-patient level.

Information Sources and Search Strategy

The formal electronic search underpinning this review was performed on 31 January 2026. PubMed/MEDLINE was used as the primary structured biomedical database, and Google Scholar was searched as a supplementary source to identify additional case reports that might not be readily captured through PubMed indexing alone. Both sources were searched from database inception to 31 January 2026, and no date filters were applied during the search process. The full database-specific search strategies are reproduced in Supplementary File 1.

The exact PubMed query executed for this review was as follows:

(("intravenous cannula" OR "peripheral intravenous cannula" OR "peripheral venous cannula" OR "peripheral intravenous catheter" OR "peripheral venous catheter" OR PIVC) AND (fracture OR fractured OR broken OR breakage OR retained OR fragment OR fragments OR embolized OR embolised OR embolization OR embolisation OR migration OR migrated OR

transection) AND ("case report" OR "case reports"))

The supplementary Google Scholar query executed on the same date was:

("intravenous cannula" OR "peripheral intravenous cannula" OR "peripheral venous catheter") AND (fracture OR broken OR retained OR fragment OR embolized OR migration) AND ("case report")

At the time of execution, the PubMed query retrieved 21 records, whereas the Google Scholar search displayed approximately 1,210 results. PubMed was treated as the principal structured source for reproducible retrieval, while Google Scholar was used as a supplementary sensitivity search to improve capture of rare and inconsistently indexed case reports. Because Google Scholar returns dynamically ranked results rather than a stable, exportable indexed set, it was not used as the basis for the numeric PRISMA flow. In keeping with PRISMA-S, the search terms, source names, execution date, and search role of each source were recorded explicitly [10], and the full strategies are reproduced in Supplementary File 1.

Study Records and Selection Process

All retrieved references were collated in a structured screening spreadsheet, and obvious duplicates were removed manually before eligibility assessment. Study selection was organized in two sequential stages consisting of title-and-abstract screening followed by full-text review. During screening, records were retained for full-text assessment whenever the title or abstract suggested peripheral intravenous cannula fracture, a retained cannula fragment, intravascular migration, or embolization related to peripheral venous access. Reports in which the device type was unclear at the title-and-abstract stage were carried forward to full-text review to reduce the risk of erroneous exclusion of rare but relevant cases.

During the full-text assessment, articles were evaluated against the predefined eligibility criteria with particular attention to whether the retained or fractured device was a peripheral intravenous cannula rather than another catheter type and whether sufficient patient-level clinical detail was available for extraction. Reasons for exclusion at the full-text stage were predefined as wrong device type, absence of patient-level data, duplicate publication, insufficient clinical detail, or non-case-based publication format. The numeric PRISMA flow was anchored to the reproducible PubMed/MEDLINE retrieval set; Google Scholar served only as a supplementary sensitivity source and therefore was not assigned a separate denominator in Figure 1.

Data Extraction and Data Items

A standardized data-extraction framework was developed before a detailed review of eligible reports. For each included case, the extracted variables included the first author, publication year, country of origin, clinical setting, patient age and sex, relevant comorbidities, indication for cannulation, cannula size or gauge, cannula material when reported, insertion site, laterality, dwell time before fracture, immediate circumstance or suspected mechanism of breakage, whether reinsertion of the introducer needle was described or suspected, anatomical location of the retained or migrated fragment, presenting symptoms and signs, interval between fracture and diagnosis, imaging or localization modality, management or retrieval technique, use of anesthesia when applicable, retrieval success, complications, follow-up information, and final patient outcome.

For analytical consistency, extracted information was organized into five prespecified clinical domains: device-related factors, procedure-related factors, patient-related factors, diagnostic approach, and management and outcome variables. Management approaches were categorized pragmatically as local surgical retrieval, open operative retrieval, image-guided or endovascular retrieval, or conservative observation when no invasive intervention was undertaken.

Methodological Quality Appraisal

The methodological quality of included reports was appraised using the framework proposed by Murad et al. for case reports and case series [12]. This framework is particularly suitable for rare adverse clinical incidents because it evaluates descriptive evidence across four domains: selection, ascertainment, causality, and reporting [12]. Given the nature of the evidence base, the appraisal was interpreted at the domain level rather than reduced to a single aggregate score, thereby allowing identification of the principal reporting limitations within each included report.

Data Synthesis

A formal meta-analysis was not undertaken because the available evidence base was rare, clinically heterogeneous, and methodologically descriptive. Instead, the findings were structured for narrative synthesis and tabular presentation. In accordance with SWiM, the synthesis framework was organized around clinically

relevant groupings, including the circumstances of cannula fracture, the pattern of fragment retention or embolization, the diagnostic methods used for localization, the retrieval or management strategy employed, and the reported clinical outcomes [11].

A formal meta-analysis was not undertaken because the available evidence base was rare, clinically heterogeneous, and methodologically descriptive. Instead, the findings were structured for narrative synthesis and tabular presentation. In accordance with SWiM, the synthesis framework was organized around clinically relevant groupings, including the circumstances of cannula fracture, the pattern of fragment retention or embolization, the diagnostic methods used for localization, the retrieval or management strategy employed, and the reported clinical outcomes [11].

Where the available data permitted meaningful comparison, cases were summarized according to age group, site of cannulation, superficial versus intravascular location of the retained fragment, and surgical versus non-surgical management. Descriptive summary measures were restricted to simple counts, proportions, and ranges when these could be derived consistently from the included literature; no pooled effect estimate was undertaken. Accordingly, the results are presented as a structured descriptive statistical synthesis rather than as inferential comparative analysis.

Because this study used data derived exclusively from previously published literature and did not involve direct patient recruitment or access to identifiable personal data, formal institutional ethics approval was not required for this type of evidence synthesis.

Results

Study Selection

The study-selection pathway is illustrated in Figure 1. The numeric counts in Figure 1 correspond to the reproducible PubMed/MEDLINE retrieval set.

The reproducible PubMed/MEDLINE search yielded 21 records. After title-and-abstract screening followed by full-text eligibility assessment against the predefined criteria, 14 publications were retained for qualitative synthesis, while 7 records were excluded. The excluded records comprised one animal report, four clinically unrelated false-positive records, one ophthalmic report in which an intravenous cannula was used as a procedural instrument rather than being the fractured device of interest, and one report involving a peripherally inserted central catheter rather than a peripheral intravenous cannula. The final evidence base consisted of 12 single-

patient case reports, one dual pediatric case report, and one 6-patient adult case series, yielding 20 individual patients overall. Because reporting completeness varied across articles, the denominator differs between individual descriptive domains.

Overall Characteristics of the Included Literature

The characteristics of the included publications and patients are summarized in Table 1.

The included publications spanned the period from 1992 to 2025, with 9 of the 14 reports (64.3%) published from 2020 onward, indicating a noticeable concentration of reporting in recent years [13; 8; 7; 14-16; 4; 17; 5]. The evidence base was dominated by isolated case descriptions, and only one publication reported more than two patients, namely a 6-patient adult case series describing a J-flap retrieval approach [7]. In reports in which age was explicitly provided, the age spectrum ranged from the first day of life to 76 years, demonstrating that this complication can occur across the full clinical age range [8; 14-15; 4; 17; 5-6; 19]. The pediatric evidence included a 1-day-old neonate, a 1-year-old infant, and a 30-month-old toddler [8; 17], whereas the adult literature included young adults, middle-aged adults, and elderly patients, including individuals aged 23, 29, 30, 40, 55, 63, and 76 years [13-16; 4-6; 19].

When the access site was reported, the event almost always originated from upper-extremity peripheral venous access. Frequently described sites included the dorsum of the hand, dorsal metacarpal veins, forearm, wrist, cubital fossa, cephalic vein, and median cubital vein [14-16; 4; 17; 5-6; 18-20]. The pediatric literature additionally described fracture after left axillary venous access and right temporal superficial venous access, demonstrating that nonstandard pediatric access locations may also be affected [8].

Circumstances and Suspected Mechanisms of Cannula Fracture

Across the included literature, fracture events clustered around four recurrent scenarios. First, several reports described repeated failed cannulation attempts, often involving continued use of the same cannula, as the immediate procedural background to catheter failure [14; 17; 6; 19]. Second, a number of cases were recognized during removal of an indwelling cannula, when inspection of the removed device showed that the tip or distal catheter segment was missing [14-16; 4-5; 18; 20]. Third, some reports highlighted the contribution of patient movement, agitation, or forceful self-removal after difficult insertion, most clearly in the intoxicated adult patient reported by Khoo et al. and in the military case reported by Lossos et al. [13; 6]. Fourth, delayed recognition of the retained fragment was documented in both older and newer reports, including the pediatric temporal-vein case that remained unrecognized for 6 days and the fatal historical report that presented with severe

infectious sequelae after embolization [8; 21].

A particularly consistent procedural theme was the potential harm of reintroducing the needle into a partially advanced plastic cannula or continuing repeated manipulations with the same device. This mechanism was explicitly described or strongly suspected in multiple contemporary reports and was repeatedly associated with transection or loss of structural integrity of the plastic catheter wall [16; 4; 6; 19]. Likewise, the toddler case and the 63-year-old adult case both emphasized multiple difficult attempts as a plausible precipitating factor [14; 17]. The 6-patient adult case series also reinforces the practical reality that accidental fracture and peripheral venous embolization are not confined to isolated anecdotes, but may present repeatedly in routine surgical practice when access is difficult or management is delayed [7].

Fragment Location, Retention Pattern, and Migration

Most fragments were either retained locally or migrated within superficial upper-extremity veins, but the literature also documented clinically important central embolization. Peripheral or locoregional venous retention accounted for the great majority of reported cases, whereas central embolization to the pulmonary artery or heart/great vessels was documented in 2 of the 20 patients (10.0%) [15; 21]. Reported peripheral locations included the cephalic vein just above the cubital fossa [16], the median cubital region [4], the dorsal metacarpal or digital venous system of the hand [6; 19], the distal forearm [17], the superficial forearm/cubital venous pathway [18], and the cephalic vein after migration from a superficial right wrist vein [20]. In the 2020 case reported by Kumar and Ranjan, migration of approximately 10 cm from the mid-forearm toward the cubital fossa was documented [5]. In the 2015 report by Singh et al., the fragment had migrated 13 cm by the time of operative retrieval [18]. A similar 13 cm distal cephalic-vein location was also described in the 2021 Fogarty-assisted retrieval report [16].

The distal direction of migration within the upper limb was not uniform. Khadim et al. described distal venous embolization to the dorsal digital vein of the middle finger, from which a 2.2 cm catheter tube was retrieved by venotomy [19]. Bloom et al. documented embolization of a 28 mm distal cannula segment from a superficial right wrist vein to the cephalic vein at the antecubital fossa, where it was localized by computed tomography before removal [20]. In the pediatric dual case report, the neonate's fragment was localized in the left subclavian and axillary venous system, whereas the second child had a retained 1.5 cm fragment after fracture of a right temporal vein catheter [8].

The most serious migration patterns involved the central circulation. Giragani et al.

reported embolization of a fractured peripheral intravenous cannula tip to the anterior segmental branch of the right descending pulmonary artery [15]. The 1992 Chest report described the severest outcome in the literature, namely fatal sepsis secondary to proximal embolization of a peripheral intravenous cannula fragment to the heart and major vessels [21]. The recent military case reported by Lossos et al. further illustrates that embolization can occur rapidly when a fractured fragment is not stabilized effectively after the initial event [13].

Diagnostic Evaluation and Localization Strategies

Clinical examination remained an important first step, but it was often insufficient as a stand-alone strategy. Several reports described a palpable linear cord, tender swelling, or localized discomfort along the course of the affected vein, thereby raising suspicion of a retained fragment [4-6; 18-19]. However, nonpalpable fragments were also common, particularly when the segment had migrated away from the puncture site or embolized centrally [15-17]. The diagnostic pathway was therefore strongly imaging-dependent.

Plain radiography yielded mixed results. In some reports, radiography helped identify a linear foreign body, including the 63-year-old woman with hand-cannula fracture, the self-inflicted adult case reported by Khoo et al., and the 2013 distal digital-vein embolus [14; 6; 19]. In contrast, radiography was inconclusive or unremarkable in other cases, particularly when the retained plastic fragment was poorly radiopaque or radiolucent [15-17; 5]. This inconsistency is clinically relevant because it demonstrates that a negative radiograph does not reliably exclude a retained peripheral cannula fragment.

Ultrasound was frequently used as the first localization modality for superficially retained fragments. Bedside or formal ultrasonography localized the retained segment in the 2025 military case, the pediatric dual case report, the Tanzanian case, the cephalic-vein migration case, and the 2021 Cureus report [13; 8; 16; 4-5]. Ultrasound was especially useful when the fragment remained within a superficial peripheral venous segment and could be correlated with focal symptoms or a palpable venous cord. Even so, sonography was not universally diagnostic. In the 2015 report by Singh et al. and in the toddler case reported by Adeosun et al., ultrasound failed to localize the fragment adequately, prompting escalation to cross-sectional imaging [17-18].

Computed tomography (CT) or CT angiography (CTA) proved decisive in a substantial proportion of the literature, especially when the fragment was nonpalpable, radiography was negative, or central embolization was suspected. CT identified the fragment in the distal forearm in the toddler case after both ultrasound and radiographs had failed [17]. Singh et al. used CT to confirm an intravascular foreign body

after unsuccessful sonographic localization [18]. Khadim et al. used CT of the affected upper limb and chest to identify distal embolization adjacent to the proximal phalanx of the middle finger [19]. Bloom et al. used contiguous axial CT with reconstructions to precisely localize a 28 mm cannula segment in the cephalic vein [20]. In the neonate, CT angiography showed the fragment within the left subclavian and axillary veins [8], whereas Giragani et al. used multidetector CT thorax to demonstrate embolization to a segmental pulmonary artery branch [15]. Collectively, these reports indicate that CT-based imaging became the decisive modality whenever bedside examination and superficial-vein imaging were insufficient.

Management Approaches

Most reports described active retrieval rather than prolonged observation, usually by local or open surgical exploration with venotomy or phlebotomy [8; 14; 16; 4; 17; 5-6; 18-20]. In adults with superficially retained fragments, direct surgical retrieval under local anesthesia was common and often involved exposure of the affected vein, venotomy, removal of the fragment, and vessel ligation or repair when required [16; 4-6; 18-20]. The Tanzanian case, the self-inflicted adult case, the 2013 distal digital-vein embolus, and the 1996 upper-limb embolization case all followed this broad operative logic [4; 6; 19-20].

Pediatric patients and deeply located fragments were more often managed under general anesthesia. The neonate in the dual pediatric report underwent open exposure of the axillary/subclavian venous segment with vascular clamping and retrieval of an intact 3.5 cm fragment [8]. The toddler reported by Adeosun et al. underwent inhalational general anesthesia followed by a wrist-crease incision and careful dissection after CT-based localization [17]. The second child in the 2025 dual report also required imaging-guided surgical removal after delayed recognition [8].

The literature additionally documented several technically distinctive management approaches. Masood et al. used a 4-Fr Fogarty catheter to retrieve a nonpalpable cephalic-vein fragment located approximately 13 cm from the cubital fossa [16]. Isiguzo et al. reported the only identified case series, describing a novel J-flap surgical technique across six adult patients managed over a 24-month period [7]. At the opposite end of the technical spectrum, Giragani et al. described successful endovascular retrieval of a pulmonary-artery embolized fragment through right femoral venous access, pulmonary angiography, and capture with a 15 mm Amplatz gooseneck snare, thereby showing that minimally

invasive retrieval may be feasible even for a radiolucent peripheral cannula fragment once it has embolized centrally [15].

Immediate Anti-migration Measures and Short-term Outcomes

Key prevention and early-response lessons distilled from the included literature are summarized in Table 3.

A recurring practical theme in the included literature was the importance of immediate steps aimed at preventing further migration once the fracture was recognized. The neonatal case was managed initially with proximal compression and positioning to minimize movement [8]. Tourniquet use was emphasized in the 1996 report, in the 2015 CT-guided operative case, in the 2021 cephalic-vein retrieval report, and in the 2025 military report [13; 16; 18; 20]. The self-inflicted adult case additionally used skin marking and wrist dorsiflexion with a splint immediately after the fractured segment was identified [6]. These maneuvers were consistently described as temporizing steps before definitive localization and retrieval.

Short-term clinical outcomes were favorable in most contemporary reports when diagnosis and retrieval were prompt. Favorable short-term outcomes were documented in 18 of the 20 patients (90.0%), whereas one child presented with localized inflammation after delayed recognition and one historical patient died of sepsis after central embolization [8; 15; 21]. Uneventful postoperative or post-procedural recovery was documented after direct operative retrieval in multiple adult patients [14; 16; 4-6; 18-20], after surgical management in the toddler [17], and after neonatal open retrieval with no complications during follow-up to 1 year [8]. The pulmonary-artery embolization case also had no periprocedural complications, and the patient was discharged the next day [15]. Nevertheless, delay in recognition was associated with more problematic presentations. The second pediatric case in the 2025 dual report was overlooked for 6 days and presented with localized inflammation before surgery [8]. The historical Chest case remains the clearest demonstration of the worst-case scenario, namely, fatal systemic infection after central embolization of the fragment [21].

Publication-level Summary of Included Cases

Overall, the published literature shows that broken peripheral intravenous cannula fragments most often remain within upper-extremity peripheral veins but can also embolize distally or centrally, including to the digital veins, axillosubclavian venous system, pulmonary artery, and heart/great vessels. Across the modern literature, the most consistent pattern of favorable outcome was rapid recognition, prevention of further migration, accurate imaging localization, and prompt definitive retrieval [13; 8; 15-16; 4; 17; 5-6; 18-20].

Methodological Quality Appraisal

The methodological quality of the included case reports and case series was appraised using the Murad et al. framework [12].

Selection representativeness was generally unclear because the evidence base consisted predominantly of isolated case reports rather than consecutive centre-based series. By contrast, ascertainment was usually strong, as most publications documented a visibly incomplete cannula, imaging-based localization, operative retrieval, or a clearly defined clinical endpoint. The causality items related to challenge/rechallenge and dose-response were not applicable to this device-related complication literature, whereas consideration of alternative causes was variably reported. Overall, the included literature was considered methodologically adequate for descriptive synthesis of presentation, localization, and management patterns, but limited for causal inference and estimation of incidence. Detailed judgments are summarized in Table 2.

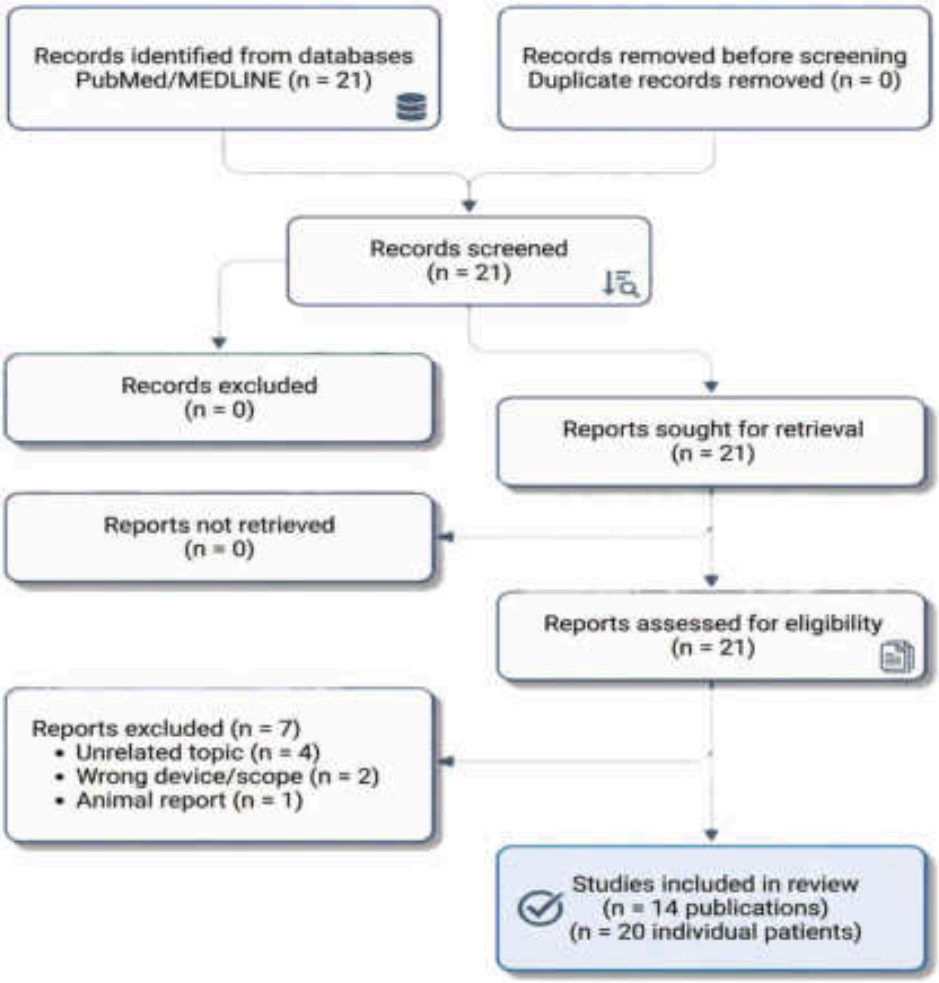

Figure 1. PRISMA 2020 flow diagram for study selection based on the reproducible PubMed/MEDLINE retrieval set (21 records screened, 21 full-text reports assessed, 7 excluded, and 14 publications representing 20 patients included).

Table 1. Characteristics of the included publications and patients*.

Ref.	Study	Design	Patients, n	Age/population	Sex	Cannula/fragment site or embolization location	Circumstance or mechanism of fracture	Diagnostic/localization method	Management	Reported outcome
[13]	Lossos, 2025	Case report	1	19-year-old adult	NR	Peripheral IV cannula used during military training; embolization after rupture	Cannula breakage during use, with concern for migration after rupture	Point-of-care ultrasound	Expedited diagnosis and management using a tourniquet-assisted approach	Prompt identification and management; report emphasized prevention of migration
[8]	Pu, 2025	Dual case report	2	1-day neonate; 1-year-old infant	Female neonate; male infant	Left axillary catheter; right temporal vein catheter	Fracture with delayed recognition in one child and prompt recognition in the other	Ultrasound and CT angiography after compression immobilization	Surgical retrieval	No complications in the promptly recognized case; localized inflammation after 6-day delay in the other case
[7]	Isiguzo, 2023	Case series	6	Adults	NR	Peripheral veins	Accidental fracture and embolization of peripheral IV cannula fragments	Not reported in abstract	Surgical retrieval using a novel J-flap technique	Successful retrieval in six adults over a 24-month period
[14]	Woo, 2023	Case report	1	63-year-old adult	Female	Hand	Repeated attempts with an 18-gauge cannula in collapsed veins and poor skin condition	Plain radiography	Venotomy in the emergency department	Successful removal; authors stressed early removal to prevent vasculitis or embolization
[15]	Giragani, 2021	Case report	1	Adult	Male	Pulmonary artery branch after peripheral IV cannula fracture	Fracture followed by intravascular embolization of a radiolucent fragment	Imaging-based localization for endovascular retrieval	Endovascular retrieval	Successful endovascular management of a pulmonary artery embolized fragment
[16]	Masood, 2021	Case report	1	Adult	NR	Cephalic vein	Broken peripheral intravenous cannula retained within the vein	Preoperative imaging	Operative retrieval with a Fogarty catheter	Successful removal; authors advocated retrieval to avoid serious complications
[4]	Nyamuryekung'e, 2021	Case report	1	76-year-old adult	Male	Cubital fossa peripheral IV cannula	Reinsertion of the guide needle into the plastic cannula sheath was suspected to have caused fracture	Ultrasound	Surgical exploration under local anaesthesia	No intraoperative or postoperative complications
[17]	Adeosun, 2020	Case report	1	30-month-old toddler	Male	Peripheral IV cannula inserted in the emergency setting	Several insertion attempts using the same cannula; retained 7-mm fragment was not palpable	Computed tomography	Surgical removal under general anaesthesia	Successful retrieval after CT localization
[5]	Kumar, 2020	Case report	1	23-year-old adult	Female	Mid-forearm/cubital fossa with proximal migration in the cephalic vein	Fracture during cannula removal with proximal migration	Imaging techniques	Venotomy and gentle retrieval	Successful retrieval; authors recommended early localization and exploration

[6]	Khoo, 2018	Case report	1	Adult	Not specified	Peripheral IV cannula; intravascular retained foreign body	Multiple attempts using the same cannula and subsequent self-removal by an intoxicated/aggressive patient	Radiological imaging	Venotomy and foreign-body removal	Successful removal after imaging confirmation
[18]	Singh, 2015	Case report	1	NR	NR	Broken intravenous cannula retained as an intravascular foreign body	Mechanism not clearly detailed in the abstract	Computed tomography-guided localization	CT-guided removal	Successful image-guided removal when localization was difficult
[19]	Khadim, 2013	Case report	1	NR	NR	Middle finger dorsal digital vein with distal venous embolization	Repeated failed attempts using the same cannula were considered to have compromised structural integrity	Radiological imaging	Venotomy in theatre	Successful retrieval of a 2.2-cm catheter fragment
[20]	Bloom, 1996	Case report	1	NR	NR	Superficial right wrist vein with migration toward the antecubital fossa	Accidental separation and embolization of a 28-mm fragment prior to tourniquet control	Computed tomography with reconstructions	Retrieval under local anaesthesia	Successful localization and retrieval after CT
[21]	Freiberg, 1992	Case report	1	NR	NR	Peripheral IV cannula embolus involving the heart and major vessels	Proximal embolization of the cannula fragment	Not reported in abstract	Not clearly reported in the abstract	Fatal sepsis with multiple septic complications

**NR indicates information not reported clearly in the source report or available extraction record. The included literature consistently supports early localization and prompt retrieval, particularly when fragment migration or embolization is suspected.*

Table 2. Methodological quality appraisal of the included publications using the Murad et al. framework*.

Reference	Design	Cases	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Overall judgement
Lossos et al., 2025	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate; strong ascertainment and reporting, but selection representativeness was unclear.
Pu et al., 2025	Dual case report	2	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; clear exposure and outcome ascertainment with useful follow-up, but selected cases only.
Isiguzo et al., 2023	Case series	6	U	Y	Y	U	NA	NA	U	U	Low-to-moderate; the series was clinically relevant, but reporting granularity and follow-up detail were limited.
Woo et al., 2023	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate; diagnosis and management were clearly described, but representativeness remained unclear.
Giragani et al., 2021	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; imaging confirmation and procedural reporting were strong, with adequate short-term outcome reporting.

Masood et al., 2021	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; localization, retrieval, and short follow-up were sufficiently reported.
Nyamuryekung'e et al., 2021	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; the report provided coherent exposure, localization, management, and outcome information.
Adeosun et al., 2020	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; CT-based confirmation and operative retrieval supported robust ascertainment.
Kumar and Ranjan, 2020	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; the case included clear localization, retrieval, and postoperative follow-up.
Khoo et al., 2018	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; the report described the precipitating context, localization, retrieval, and immediate outcome adequately.
Singh et al., 2015	Case report	1	U	Y	Y	U	NA	NA	U	U	Moderate; exposure and outcome were identifiable, but the report available for appraisal provided limited follow-up and reporting detail.
Khadim et al., 2013	Case report	1	U	Y	Y	Y	NA	NA	Y	Y	Moderate-to-high; the embolization pathway, imaging confirmation, retrieval, and recovery were sufficiently described.
Bloom et al., 1996	Case report	1	U	Y	Y	Y	NA	NA	Y	U	Moderate; exposure and retrieval were well established, although reporting detail was briefer than in newer reports.
Freiberg and Barnes, 1992	Case report	1	U	Y	Y	U	NA	NA	Y	U	Low-to-moderate; the catastrophic outcome was clear, but the published report available for appraisal offered limited methodological detail.

**Y indicates that the criterion was judged to be met based on the published report; U indicates that the item was unclear or insufficiently reported; NA indicates that the item was judged not applicable to this device-related complication literature. Questions Q5 and Q6 were treated as not applicable because the retained-fragment literature addresses a device-related procedural complication rather than a pharmacological exposure-response scenario [12].*

Table 3. Practical prevention and early-response lessons derived from published cases of peripheral intravenous cannula fracture*.

Domain	Practical lesson	Rationale from the published case literature	Clinical implication
Prevention	Do not reinsert the introducer needle into a partially advanced plastic cannula.	Repeated case reports linked reinsertion and repeated manipulation to cannula damage or subsequent fracture [4] [5] [6] [14].	Discard the device and restart with a new cannula if advancement fails.
Prevention	Avoid repeated attempts with the same cannula, especially in difficult access or agitated patients.	Fracture often followed difficult cannulation, repeated manipulation, or movement-related stress on the device [5] [6] [8].	Escalate early to a more experienced operator or an alternative access strategy.
Recognition	Inspect the cannula immediately after insertion failure or removal and presume intravascular retention if any segment is missing.	Delayed recognition was a recurring precursor to proximal migration and more complex retrieval [4] [5] [15] [19].	Treat an incomplete catheter as a time-sensitive intravascular foreign body until proven otherwise.
Immediate response	Limit migration immediately with proximal compression, tourniquet placement when appropriate, limb immobilization, and minimal manipulation.	Multiple reports described anti-migration measures before definitive localization and extraction [6] [8] [13] [16] [18] [20].	Containment should begin before transfer or advanced imaging whenever clinically feasible.
Localization	Use ultrasound first for suspected superficial retention, but escalate promptly when findings are inconclusive.	Ultrasound repeatedly localized superficial fragments, but CT-based imaging was often needed when radiographs were negative or migration was deeper/central [4] [5] [8] [13] [15] [18] [20].	Adopt a stepwise imaging strategy rather than relying on plain radiography alone.
Retrieval	Choose the retrieval technique according to fragment location and available expertise rather than using a single universal method.	Successful management included venotomy, phlebotomy, Fogarty-assisted extraction, J-flap retrieval, and endovascular retrieval [7] [15] [16] [17] [20].	Superficial peripheral fragments usually require direct operative retrieval, whereas central embolization may warrant interventional or endovascular management.
Systems learning	Document the event and feed the case back into vascular-access training and adverse-event learning systems.	The evidence suggests that many fracture events are preventable and reflect remediable procedural behavior rather than unavoidable device failure alone [1] [22].	Use each event as a quality-improvement trigger for competency reinforcement and protocol review.

**This synthesis table translates recurrent patterns from the case literature into practical bedside and systems-level actions. It is intended to support prevention, early recognition, containment, localization, and retrieval planning rather than to imply comparative effectiveness between techniques.*

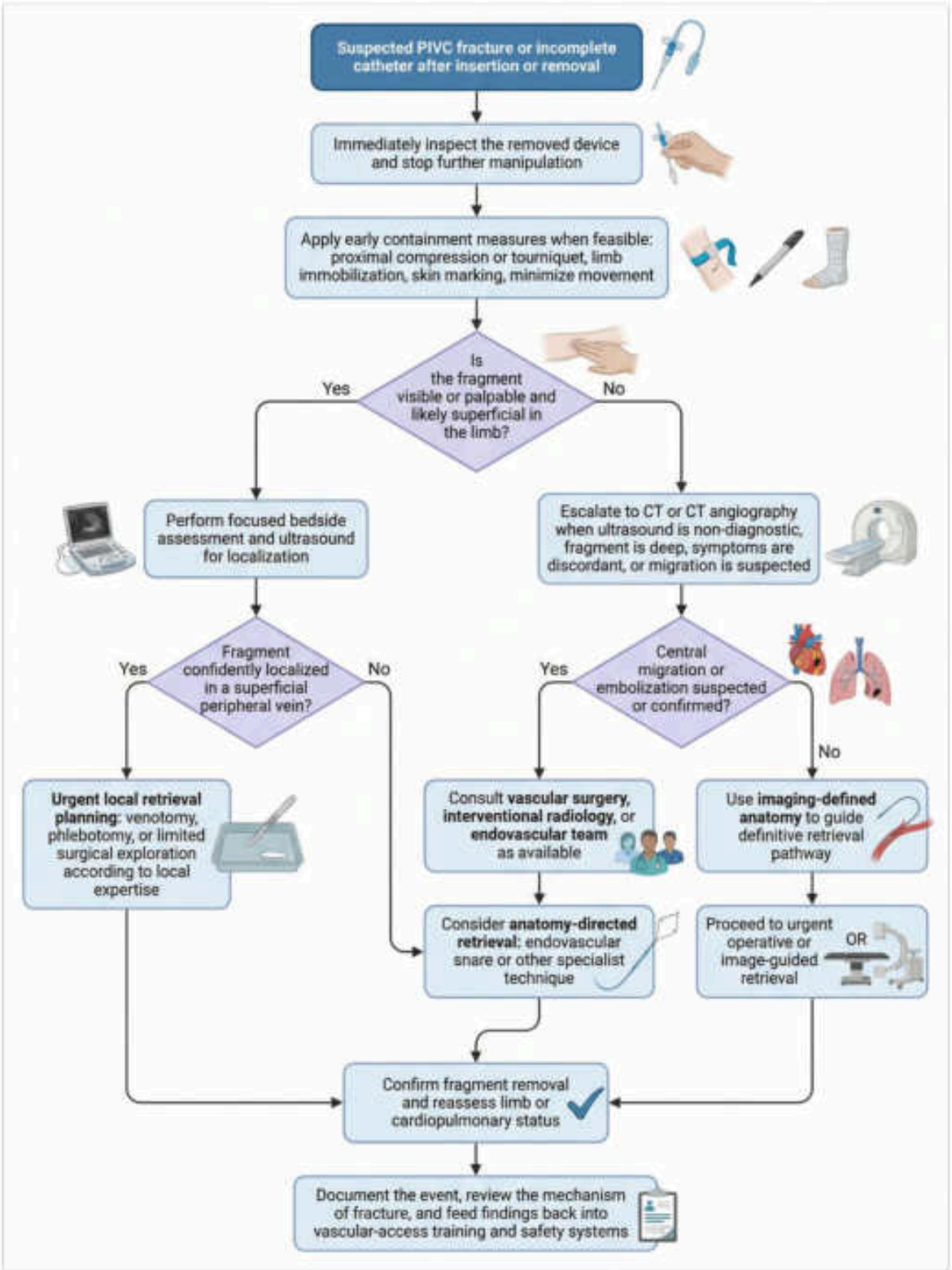

Figure 2. Suggested clinical pathway for suspected peripheral intravenous cannula fracture, retention, or embolization.

The algorithm synthesizes the management logic repeatedly observed across the included case literature: immediate recognition of an incomplete cannula, early containment to reduce migration, anatomy-appropriate localization, and retrieval tailored to the fragment location and available expertise.

Strengths and Limitations

A major strength of this review is its focused synthesis of a rare but clinically consequential complication of peripheral intravenous cannulation. By consolidating dispersed case reports and small case series, the review provides a patient-level overview of recurrent fracture mechanisms, fragment locations, localization strategies, and retrieval approaches that are otherwise difficult to interpret from isolated publications.

Methodologically, the review used a transparent reporting structure aligned with PRISMA 2020, PRISMA-S, and SWiM, and the included reports were appraised using the Murad et al. framework for case reports and case series [9-12]. This improves interpretability by making explicit both the reproducible search structure and the low-certainty nature of the underlying evidence.

The main limitations arise from the source literature itself. Nearly all included publications were single-patient case reports or very small case series, and many incompletely reported variables such as cannula gauge, material, dwell time, operator experience, interval to recognition, anti-migration measures, and duration of follow-up. As a result, the review cannot estimate incidence, quantify risk factors, or compare the effectiveness of competing retrieval techniques with confidence.

A further limitation is that the reproducible numeric flow was anchored to PubMed/MEDLINE, while Google Scholar was used only as a supplementary sensitivity search. Although this is methodologically defensible for a rare-event review, some non-indexed or difficult-to-retrieve reports may still have been missed. The conclusions should therefore be interpreted as evidence-informed clinical guidance based on pattern recognition rather than as high-level comparative recommendations.

Conclusion

This systematic review indicates that peripheral intravenous cannula fracture is an uncommon but clinically important complication. However, the available case-based evidence only suggests, rather than proves, that these events should be approached as time-sensitive intravascular foreign-body events rather than minor technical mishaps. Across the published case literature, fracture was repeatedly associated with modifiable procedural factors, particularly repeated attempts, continued manipulation of the same device, reinsertion of the introducer needle into a partially advanced cannula, and delayed recognition

of an incomplete catheter after insertion or removal.

When fracture is suspected or confirmed, the available reports support prompt efforts to limit further migration, localize the fragment with anatomy-appropriate imaging, and pursue retrieval according to the anatomical site and available expertise. Ultrasound appears particularly useful for superficially retained fragments, whereas CT-based imaging becomes especially important when the fragment is non-palpable, radiography is non-diagnostic, or central embolization is suspected. Because the evidence base is restricted to case reports and small case series, no comparative conclusion can be drawn regarding the superiority of one retrieval technique over another.

At a systems level, these findings support consideration of fracture-prevention messages in routine vascular-access training, including avoidance of needle reinsertion, abandonment of a cannula after failed advancement, careful inspection of the device after removal, and early escalation when a retained segment is suspected. Future progress will depend on multicentre reporting and more standardized adverse-event documentation so that the incidence, mechanisms, and optimal management pathways of this rare complication can be defined more precisely.

Competing Interests

The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate

This study is a systematic review based exclusively on previously published literature and did not involve direct recruitment of human participants, intervention, or access to identifiable personal data. Accordingly, formal ethics committee approval and informed consent to participate were not required for this evidence synthesis.

Consent for Publication

Not applicable.

Data Availability

All data analyzed in this review are presented within the main manuscript tables and derive from the cited published reports. No external dataset was generated for this study. A structured extraction file can be made available by the corresponding author upon reasonable request.

References

1. Marsh N, Larsen EN, Ullman AJ, Mihala G, Cooke M, Chopra V, Ray-Barruel G, Rickard CM. Peripheral intravenous catheter infection and failure: a systematic review and meta-analysis. International Journal of Nursing Studies. 2024;151:104673. https://doi.org/10.1016/j.ijnurstu.2023.104673.

2. Marsh N, Webster J, Ullman AJ, Mihala G, Cooke M, Chopra V, Rickard CM. Peripheral intravenous catheter non-infectious complications in adults: a systematic review and meta-analysis. Journal of Advanced Nursing. 2020;76(12):3346-3362. https://doi.org/10.1111/jan.14565.

3. Lim S, Gangoli G, Adams E, Hyde R, Broder MS, Chang E, Reddy SR, Tarbox MH, Bentley T, Ovington L, Danker W. Increased clinical and economic burden associated with peripheral intravenous catheter-related complications: analysis of a US hospital discharge database. Inquiry. 2019;56:46958019875562. https://doi.org/10.1177/0046958019875562.

4. Nyamuryekung'e MK, Mmari EE, Patel MR. A missing piece: fracture of peripheral intravenous cannula, a case report. International Journal of Surgery Case Reports. 2021;78:296-299. https://doi.org/10.1016/j.ijscr.2020.12.030.
5. Kumar RR, Ranjan P. Case report: iatrogenic fracture of intravenous cannula during removal with proximal migration. International Journal of Surgery Case Reports. 2020;76:562-565. https://doi.org/10.1016/j.ijscr.2020.09.037.
6. Khoo PJ, Tay KL, Jamaluddin AA, Gunasaker D. Self-inflicted and iatrogenic peripheral intravenous cannula fracture: a case report. Annals of Medicine and Surgery. 2018;33:44-46. https://doi.org/10.1016/j.amsu.2018.08.004.
7. Isiguzo C, Opara C, Uzoho A, Opara K. Management of accidental fracture and embolization of intravenous cannula in peripheral veins using a novel J-flap technique: a case series. Nigerian Journal of Clinical Practice. 2023;26(6):832-836. https://doi.org/10.4103/njcp.njcp_887_22.
8. Pu L, Zhang Y, Chen W, Meng H. Nursing vigilance in preventing catheter fragment migration: a dual case report of peripheral venous catheter fractures in pediatric practice. Frontiers in Pediatrics. 2025;13:1638983. https://doi.org/10.3389/fped.2025.1638983.
9. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. https://doi.org/10.1136/bmj.n71.
10. Rethlefsen ML, Kirtley S, Waffenschmidt S, Ayala AP, Moher D, Page MJ, et al. PRISMA-S: an extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews. Systematic Reviews. 2021;10(1):39. https://doi.org/10.1186/s13643-020-01542-z.
11. Campbell M, McKenzie JE, Sowden A, Katikireddi SV, Brennan SE, Ellis S, et al. Synthesis without meta-analysis (SWiM) in systematic reviews: reporting guideline. BMJ. 2020;368:l6890. https://doi.org/10.1136/bmj.l6890.
12. Murad MH, Sultan S, Haffar S, Bazerbachi F. Methodological quality and synthesis of case series and case reports. BMJ Evidence-Based Medicine. 2018;23(2):60-63. https://doi.org/10.1136/bmjebm-2017-110853.
13. Lossos B, Einav S, Gendler S, Assouline O. Utilizing point-of-care ultrasound and tourniquet placement for expedited diagnosis and management of intravenous cannula breakage: a case report. Military Medicine. 2025. https://doi.org/10.1093/milmed/usaf617.
14. Woo S, Nah S, Kim G, Han S. Fracture of an intravenous cannula in the hand: a case report. Journal of Emergency Nursing. 2023;49(2):156-161. https://doi.org/10.1016/j.jen.2022.11.012.
15. Giragani S, Singh MK, Gonuguntla HK, Muthyala S, Alwala S. Pulmonary embolization of radiolucent intravenous cannula: endovascular retrieval. Indian Journal of Radiology and Imaging. 2021;31(4):1036-1038. https://doi.org/10.1055/s-0041-1735926.
16. Masood A, Malik MJ, Khan MI. A foreign body in the cephalic vein: broken piece of intravenous cannula. Cureus. 2021;13(10):e18813. https://doi.org/10.7759/cureus.18813.
17. Adeosun PO, Abdulazeez AT, Okeke UI, Ehinmosan OE, Eze EG. CT-guided retrieval of a fractured intravenous cannula in a toddler: a case report. African Journal of Emergency Medicine. 2020;10(4):277-280. https://doi.org/10.1016/j.afjem.2020.06.010.
18. Singh A, Kaur A, Singh M, Kaur S. CT-guided removal of iatrogenic foreign body: a broken intravenous cannula. Journal of Clinical and Diagnostic Research.

2015;9(9):PD28-PD29. https://doi.org/10.7860/JCDR/2015/14344.6549.
19. Khadim MF, Leonard D, Moorehead RA, Hill C. Back to basics: iatrogenic intravenous cannula embolus. Annals of the Royal College of Surgeons of England. 2013;95(7):110-111. https://doi.org/10.1308/003588413X13629960047830.
20. Bloom AI, Woolf YG, Cuenca A. Accidental embolization of an intravenous cannula in the upper limb: retrieval following computed tomography localization. European Journal of Emergency Medicine. 1996;3(2):106-107. https://doi.org/10.1097/00063110-199606000-00009.
21. Freiberg DB, Barnes DJ. Fatal sepsis following peripheral intravenous cannula embolus. Chest. 1992;101(3):865-866. https://doi.org/10.1378/chest.101.3.865.
22. Thompson J, Steinheiser MM, Hotchkiss JB, Davis J, DeVries M, Frate K, et al. Standards of care for peripheral intravenous catheters: evidence-based expert consensus. British Journal of Nursing. 2024;33(21):S32-S46. https://doi.org/10.12968/bjon.2024.0422.

انكسار واحتباس وهجرة واستخراج شظايا القنية الوريدية المحيطية: مراجعة منهجية لتقارير الحالات المنشورة والسلاسل الصغيرة من الحالات

باڤل مصطفى كريم[1*]، عرفان عمر علي[1]، بشير محمد رسول[2,3]، محمد أحمد خضر[2]، بيوند جمال حسن[1]

[1] قسم التمريض، المعهد التقني الكردستاني، السليمانية، إقليم كردستان، العراق

[2] قسم تمريض البالغين، كلية التمريض، جامعة رابرين، رانية، السليمانية، العراق

[3] كليات التمريض، جامعة التنمية البشرية، السليمانية، العراق

المؤلف المراسل:

البريد الإلكتروني: **Pavelmustafa20@gmail.com**

الملخص

صُممت هذه الدراسة لتكون مراجعة منهجية لتقارير الحالات وسلاسل الحالات الصغيرة المنشورة. وقد نُظمت عملية اختيار الدراسات وإعداد التقارير وفقاً لمعايير PRISMA 2020 وPRISMA-S، كما جرى تجميع النتائج وعرضها سردياً بما يتماشى مع منهجية SWiM، ووُفرت استراتيجيات البحث الكاملة والقابلة للتكرار في الملف التكميلي رقم 1. أسفر البحث القابل للتكرار في قاعدتي بيانات PubMed وMEDLINE عن تحديد 21 سجلاً، شملت عملية التجميع النوعي 14 منشوراً تضمنت بيانات 20 مريضاً. غطت الأدبيات الفترة الزمنية من عام 1992 إلى 2025، حيث نُشرت 9 من أصل 14 دراسة (بنسبة 64.3%) في عام 2020 وما بعده. وتراوحت أعمار المرضى بين حديثي الولادة (بعمر يوم واحد) وكبار السن (بعمر 76 عاماً). نشأت الحالات في الغالب نتيجة استخدام الوصول الوريدي المحيطي في الأطراف العلوية، وارتبطت عادةً بممارسات مثل محاولات الإدخال المتكررة، وإعادة إدخال إبرة التوجيه (المُدخِل) في قنية (كانولا) تم دفعها جزئياً، أو التلاعب بالجهاز، أو صعوبة الإزالة. عادةً ما بقيت الأجزاء المكسورة داخل الأوردة السطحية للأطراف العلوية، رغم توثيق حالات انتقال الأجزاء (الانصمام) إلى مواقع مركزية مثل الشريان الرئوي أو القلب أو الأوعية الدموية الكبيرة لدى مريضين من أصل 20 (بنسبة 10.0%). وكان التصوير بالموجات فوق الصوتية والتصوير المقطعي المحوسب أكثر الوسائل فعالية لتحديد الموقع في الحالات التي كانت فيها نتائج التصوير الشعاعي سلبية أو غير حاسمة. تمثلت آلية التعامل في الغالب في الاستخراج النشط، وسُجلت نتائج إيجابية على المدى القصير لدى 18 مريضاً من أصل 20 (بنسبة 90.0%). وتشير الأدلة المستمدة من الحالات المتاحة إلى ضرورة التعامل مع أجزاء القنية الوريدية المحيطية (PIVC) المكسورة باعتبارها أجساماً غريبة داخل الأوعية الدموية تتطلب تدخلاً عاجلاً. وتدعم هذه النتائج استراتيجية عملية تركز على تجنب إعادة إدخال الإبرة والتلاعب المتكرر بالقنية نفسها، مع ضرورة الاحتواء الفوري، وتحديد الموقع باستخدام التصوير، والاستخراج الموجه تشريحياً، مع الإقرار بأنه لا يمكن تحديد الفعالية المقارنة بناءً على الأدبيات الحالية. الكلمات المفتاحية: قنية وريدية محيطية؛ قسطرة وريدية محيطية؛ كسر القسطرة؛ جسم غريب متبقٍ داخل الأوعية؛ انصمام القنية؛ بضع الوريد؛ الاستخراج داخل الأوعية؛ مراجعة منهجية

الكلمات المفتاحية: القنية الوريدية المحيطية؛ القسطرة الوريدية المحيطية؛ انكسار القسطرة؛ جسم غريب داخل الأوعية محتجز؛ انصمام القنية؛ بضع الوريد.