

CRASHCARD EXTRAVASATION VAN NON-CYTOTOXIC AGENTS

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ESSENTIAL: An agent capable of causing blistering, tissue sloughing, or necrosis when it escapes from the intended vascular pathway into surrounding tissues.					
IRRITATION: An agent causing pain at the injection site or veins when it escapes from the intended vascular pathway without resulting long lasting inflammation or tissue damage.					
NON-VESICANT: An agent of which it is unlikely to cause any damage or irritation. For comfort dry or cold compresses can be used.					
UNKNOWN: An agent of which it is unknown what kind of injury might occur when escaping the intended vascular pathway					
TREATMENT STRATEGIES (few are not mentioned in crashcard, but possible to consider)			ASSUMPTIONS		
- No special treatment is necessary ? Treatment strategy unknown 1 Dry cold compresses / cold pack: apply cold pack immediately for at least 1 hour. Following by a few times a day for at least 15 minutes. 2 Hyaluronidase: inject 150 IE = 1 ml Hylase® (max 1500 IE) subcutaneous around the injection site. Consult 3 Silver sulfadiazine 1% ointment: daily application 4 Dry warm compresses / warm packs: apply heat so it is comfortable for the patient. 4 times daily for 20 minutes. 5 Phentolamine: inject 5-10 mg in NaCl 0.9% 10-15 ml within 12 hours. Consult plastic surgeon. 6 Extravasation/flush protocol in severe cases. Consult plastic surgeon. 7 Lidocaine of mepivacaine 1-2%: 5-10 ml administration 8 Heparin 500 USP administration, no standard treatment. Only when anticoagulation effect is indicated. 9 Nitroglycerin 2% topical application			PHYSIOLOGICAL PH: 5.0-9.0 LOW PH: ≤ 8.0 HIGH PH: ≥ 9.0 PHYSIOLOGICAL OSMOLARITY: 200 - 900 mOsm/L HIGH OSMOLARITY: ≥ 900 mOsm/L LOW OSMOLARITY: ≤ 200 mOsm/L		
Drug	Osmolality	pH	Pharmacological properties	Extravasation (ref)	Treatment strategy, in order of use
Aciclovir		high		Severe tissue damage and necrosis (high pH (11) and osmolality -physiological) * (7)	4 + 2 + 6
Alfacalcidol	high	low		Irritation and pain (pH -physiological (7.5) and high osmolality (8000 mOsm/kg)) * (13)	4 + 2 + 6
Amiodarone		low		Severe tissue damage and necrosis (low pH (-4) and osmolality -physiological) (1)(7)	4 + 2 + 6
Aranidine	high	low		Severe tissue damage and irritation are possible (pH - 5.6 and high osmolality (950 mOsm/kg)) (1)(2)(7)	4 + 2 + 6
Atracurium	high	high		Irritation (low pH (3.25 to 3.65)) (1)	4 + 2 + 6
Calcium chloride 10%	high	high		Necrosis, irritation and skin ablation (osmolality 1765 mOsm/kg, pH - physiological) (5)(7)(8)(17)	4 + 2 + 6
Calcium gluconaat 10%	high	high		pH physiological, osmolality 660 mOsm/kg (5)	4 + 2 + 6
Co-trimoxazole		high		Damage to tissue, irritation and pain (high pH (9.0-10.5)) (1)(11)(13)	4 + 2 + 6
Dantrolene		high		Necrosis (high pH (8.5-11) and osmolality -physiological) (1)(10)(17)	4 + 2 + 6
Dosmopressin		low	vasoconstrictor activity	Severe tissue damage and pain (vasoconstrictor, low pH (4) and osmolality -physiological) (1)(8)(10)	4 + 2 + 6
Dioxin	high	high		Severe tissue damage and necrosis (pH -physiological, osmolality high) (1)(5)(11)	4 + 2 + 6
Dobutamine		low	vasoconstrictor activity	Severe tissue damage and necrosis (vasoconstrictor, low pH (2.5-5.5) and osmolality -physiological) (1)(5)(7)(14)	4 + 2 + 6
Dopamine	high	low	vasoconstrictor activity	Severe tissue damage and necrosis (vasoconstrictor, low pH (2.5-5.0) and osmolality 560mOsm/kg (1)(5)(7)(14)	4 + 2 + 6
Epinephrine (with or without tetracaine)		low	vasoconstrictor activity	Severe tissue damage and necrosis (vasoconstrictor, low pH (2.5-5.0) and osmolality -physiological) (348 mOsm/kg)) (1)(7)(8)	4 + 2 + 6
Epoestrolenol	high	high		Damage to tissue (high pH (11-12) and osmolality - physiological (150 - 350 mOsm/kg)) *	4 + 2 + 6
Esmolol		low		Damage to tissue, necrosis and blistering are possible (low pH (4.5-5.5) and osmolality (300 mOsm/L)) *	1 + 6
Fluorescein		high		Severe tissue damage, necrosis, and pain. pH 8-10 (1)(5) (17)	4 + 2 + 6
Glucose ≥10%		high		Damage to tissues, irritation and pain (pH range: 3.5-6.5 and high osmolality 10-50% (504-2520 mOsm/L)) (8)(10)(11)	4 + 2 + 6
Nitroglycerin		low		Severe damage to tissues (pH range: 3.0-6.5 and osmolality -physiological) (1)(6)(11)	4 + 2 + 6
Hemalin	high	high	additives: ethanol/ propylenealcol	Tissue damage, necrosis, and pain (pH 8.5-9.5) (17)	4 + 2 + 6
Magnesium sulfate (and - Nitro)	high	high		Damage to tissues (physiological pH (5.5-7.0) and high osmolality Magnesium sulphate - 10g/50ml = Necrosis and pain (pH range: 4.5-7.0 and varying osmolality (1)(2)(7) - mannitol Baxter 10% 550mOsm/L, 15%	4 + 2 + 6
Norepinephrine		low	vasoconstrictor activity	Ischemia and necrosis (vasoconstrictor, low pH (3.4 to 4.4) and osmolality -physiological) (1)(5)(8)	4 + 2 + 6
Phenobarbital		high	additive propylene glycol	Severe tissue damage and necrosis (high pH (8.5-10.5) and osmolality physiological) (1)(2)(7)	4 + 2 + 6
Phenylephrine		low	vasoconstrictor activity	Severe tissue damage, necrosis and moulting (pH range: 3.0-6.5 low, osmolality physiological) (1)(5)(11)	4 + 2 + 6
Phenytoin		high		Necrosis, irritation and inflammation (high pH (10-12) and osmolality -physiological) (1)(7)(8)	4 + 2 + 6
Polidocanol		high		Pain and necrosis	paravasale: 2 + 6 * intra-arterial: 7 + 8 *
Potassium chloride	high	high		Pain, irritation and damage to tissues is possible due to high osmotic property (pH range: 4.0-8.0 and high osmolality * 7.5% 1750 mOsm/kg, 10% 2415 mOsm/kg) (1)(2)(7)(8)	4 + 2 + 6
Promethazine		low		Severe tissue damage, pain, necrosis and gangrene to extremities (low pH (2.5-3.5) and osmolality -physiological) (1)(5)(7)(14)	4 + 2 + 6
Sodium bicarbonate	>4.2% high			Pain and moulting (pH -physiological and varying osmolality) (1)(2)(7)(8)	4 + 2 + 6
Sodium chloride ≥3%	high			(1.4%):33.5 mOsm/L,(4.2%): 1000 mOsm/L, (8.4%): 2000 mOsm/L (17) Ischemia and necrosis (pH range: 4.0-7.0 and high osmolality (3% 939 mOsm/kg, 10% 3422 mOsm/l)) (2)(7)(14)	4 + 2 + 6
Terlipressin			vasopressor activity	Necrosis (vasoconstrictor, low pH and osmolality -physiological) (2)(5)(7)(8)	4 + 5 + 6 + 9
Thiopental		high	cytotoxicity	Necrosis (high pH 10-11) (1)(7) (17)	4 + 2 + 6/8
Doxycycline		low (US), phys (EU/NL)		Severe tissue damage (US product: low pH 1.8-3.3; Dutch product: pH >6) (1)	4 + 2 + 6; Lower pH more conservative
Ethanol 100%				Necrosis (15)	1 + 6
Etomidate				Necrosis and pain (pH -physiological, osmolality 400mOsm/kg) *(1)	1 + 6
Iron (monofer/cosmofor)				Necrosis, inflammation, pain and brown discoloration of the skin (pH 5-7 and high physiological osmolality)	1 + 6
Metronidazole				Gangrene and necrosis to extremities (pH range: 4.5-7.0 and osmolality -physiological) (1)(6)(11)	1 + 6
Propofol				Pain, swelling and necrosis *(1)	1 + 6
Vancomycin		low		Necrosis, irritation and pain (low pH (3.5) and osmolality -fysoloisch) (1)(2)(7)(8)	4 + 2 + 6
Acetazolamide		high		Irritation, damage to tissues and ulceration are possible (high pH (9.6) and high osmolality (548 mOsm/kg)) (2)(3)(4)	4 + 2 + 6
Amikacin		low		Tissue damage (low pH (4.5) and osmolality -physiological (317 mOsm/kg)) (2)	4 + 2 + 6
Amoxicillin (clavulanic acid)		high		Necrosis is possible (high pH (8-10)) (6)(9)	4 + 2 + 6
Amphotericin B		low		Irritation and damage to tissue are possible (pH and osmolality -physiological) (1)(2)	4 + 2 + 6
Atropine		low		Damage to tissues (low pH (3.0-4.0) and osmolality-physiological) *(4)(6)	4 + 2 + 6
Benzylpenicillin		low		Irritation and pain are possible (pH and osmolality -physiological) *(4)(6)	1 + 3 + 6
Caffeine citrate		low		Skin necrosis (low pH (4.7)) *	4 + 2 + 6
Casopfungin				Damage to tissue and pain are possible (pH and osmolality physiological) (1)(11)	1 + 6
Cefotaxime				Damage to tissue and pain are possible (physiological pH (5.2), osmolality dependent on concentration 145mOsm/L in WFI 525mOsm/kg) (2)(17)	4 + 2 + 6
Ciprofloxacin		low		Tissue damage is possible (low pH (4.2) and osmolality -physiological) (2)	4 + 2 + 6
Clindamycin			additives: Sodiumhydroxide, benzylalcohol	Irritation and pain (pH and osmolality -physiological) (2)	1 + 6
Clonazepam		low	additives: Ethanol(96%)	Damage to tissue (low pH (3.4-4.3)) (1)(11)(13)	4 + 2 + 6
Diazepam		high		Irritation and blistering are possible (pH and osmolality - physiological (Kennisbank) (pH (6.6) and high osmolality)	4 + 2 + 6
Doxapram		low		Irritation (low pH 3.5-5, osmolality physiological) (1)	4 + 2 + 6
Enoximone		high	additives: ethanol (9.8% g/v), propylene glycol (41% g/v), sodiumhydroxide	Damage to tissue (high pH (-12)) (1)	4 + 2 + 6
Erythromycin			chemical irritation	Damage to tissues is possible (pH and osmolality -physiological) (1)(2)	1 + 6
Foscarnet				Tissue damage is possible (pH -physiological) (6)(11)	1 + 6
Ganciclovir		high		Irritation (high pH (-11) and osmolality -physiological) *(2)	4 + 2 + 6
Gentamicin		low		Irritation and blistering are possible (low pH (3.0-5.0) and osmolality -physiological) *(1)(2)	4 + 2 + 6
Heparin				Irritation and necrosis are possible (pH and osmolality -physiological) (2)(11)	1 + 6
Iloprost			additives: ethanol, tromethamine	Damage to tissues an damage to nerves are possible caused by ethanol and tromethamine (pH range: 7.8-8.8) *(6)(11)	1 + 6
Indometacin				Damage to tissues is possible (pH -physiological) (1)(6)	1 + 6
Isoprenaline	low	low		Damage to tissues is possible (low pH (3.5-4.2-5.4) and low osmolality) (6)	4 + 2 + 6
Itraconazole		low		Damage to tissues is possible (low pH (4.5)) (6)(11)	4 + 2 + 6
Labetalol		low		Damage to tissues is possible (low pH (3.0-4.5), osmolality - physiological) (11) (17)	4 + 2 + 6
Lidocaine		low		Damage to tissues is possible (low pH (4.0-5.5) and osmolality - 2% solution is physiological (270-320 mOsm/kg), 10% solution 701 mOsm/kg) *(6)(11)(17)	4 + 2 + 6
Lorazepam	high		additives: benzylalcohol, propylene glycol	Gangrene is possible after intra-arterial injection (pH -physiological and high osmolality) *(1)(2)	1 + 6
Methythionine	low (before reconstitution)	low		Damage to tissues and necrosis are possible (vasoconstrictor, low pH (3-4.5) and low osmolality) (5)(6)	4 + 2/9 + 6
Midazolam	low	low		Damage to tissue and pain are possible (physiological pH (approximately 5-9) low pH (3-4) and osmolality -physiological, 5mg/ml, hypo-osmotic) (1)(2)(6)	4 + 2 + 6
Morphine		low		Damage to tissues and necrosis is possible (low pH (2.5-6.5) and osmolality -physiological) (1)(11)(13)	4 + 2 + 6
Mycophenolic acid		low	additive polysorbate	Irritation (low pH (2.4-4.1), osmolality physiological) (4)(6)(11)	4 + 2 + 6
Naloxon		low		Damage to tissues and necrosis are possible (low pH (3 to 6.5)) (1)(11)(13)	4 + 2 + 6
Nimodipine	high	high		Damage to tissues is possible (pH -physiological (6.6) and high osmolality (740 mOsm/kg)) *(6)	4 + 2 + 6
Octreotide		low		Damage to tissues is possible (low pH (3.9 to 4.5)) (1)(6)	4 + 2 + 6
Ondansetron		low		Damage to tissues is possible (low pH (3.3-4) and osmolality -physiological) (2)(11)(13)	4 + 2 + 6
Pantoprazole		high		Damage to tissues is possible (high pH (9-10.5) and osmolality -physiological) (1)(6)	4 + 2 + 6
Paraverine		low		Damage to tissues is possible (low pH (3-4) (16)	4 + 2 + 6
Pentamidine		low		Ulceration and necrosis are possible (low pH (4.09-5.4) and osmolality range: 160-455 mOsm/L) (1)(7)	4 + 2 + 6
Pethidine		low		Irritation is possible (low pH (3.5-6)) *(1)	4 + 2 + 6
Phosphate (sodium potassium)	high	high		Unknown (pH -physiological (6.2-6.8) and high osmolality) (1)(11)	4 + 2 + 6
Piperacilline/tazobactam				Damage to tissues is possible (pH and osmolality -physiological) (1)(2)(6)(11)	1 + 6
Quinine	high	low		Damage to tissues is possible (low pH (2.0-3.0) osmolality 553mOsm/kg) (6)(11)(17)	4 + 2 + 6
Rifampicin		high		Irritation and inflammation (high/physiological pH (8-8.8)) *(6)(11)	4 + 2 + 6
Salbutamol		low		Damage to tissues is possible (low pH (3.5) (11)(13)	4 + 2 + 6

Sodium thiosulfate	high			Damage to tissues is possible (pH ~ physiological range: 7.0-9.0, osmolality >2000mOsm/kg) (1)(6)(11)(17)	4 + 2 + 6
Tetracosactide		low		Irritation is possible (low pH (3.8-4.5) *(1)(6)(11)(13)	4 + 2 + 6
Valproic acid	high			pH 7-8.5, osmolality 1230-1371 mOsm/kg (17)	1 + 6
Alteplase			proteolytic properties	Bleeding and/or inflammation are possible. Be aware of proteolytic properties, pH (7.3) and osmolality ~physiological (6)**	1 + 6
Abatacept				Unknown (pH ~physiological) *	-
Abciximab				Unknown (pH ~physiological) (1)	-
Alemtuzumab				Unknown (pH ~physiological) (7.0-7.4) *	-
Anti-hepatitis B immunoglobulin				Unknown (pH ~physiological) (1)	-
Anti-rhesus (D) immunoglobulin				Unknown (osmolality ~physiological) *	-
Anti-tetanus immunoglobulin				Unknown (pH ~physiological) (1)	-
Anti-trombin				Unknown (pH ~physiological) (1)	-
Anti-varicella zoster immunoglobulin				Unknown (pH ~physiological) (1)	-
Artesunate				Unknown (pH and osmolality ~physiological) (6)	-
BMR-vaccin				Unknown	-
Bumetanide				Unknown (pH and osmolality ~physiological) (1)	-
Butylscopolamine				Unknown (osmolality ~physiological) (1)	-
C1 - esterase inhibitor				Unknown (pH and osmolality ~physiological) (10)	-
Ceftazidime				Unknown (pH and osmolality ~physiological) (2)	-
Ceftriaxone				No severe reactions (pain) (pH and osmolality ~physiological) (2)	-
Ciclosporin				Unknown (pH ~physiological) (11)	-
Crosslinking factor VIIa				Unknown (pH ~physiological) *	-
Colistin				Unknown (pH and osmolality ~physiological) (1)(11)	-
Danaparoid				Unknown (pH and osmolality ~physiological) (1)(11)	-
Darbepoetin				Unknown (pH ~physiological) (10)	-
Dexamethasone				Unknown (pH ~physiological) (1)	-
Fentanyl		low		No severe reactions (pH ~physiological (6) and low osmolality (14 mOsm/kg)) (2)	-
Flecainide				Unknown (pH ~physiological) (11)	-
Fluconazole				Unknown (pH and osmolality ~physiological) (1)(11)	-
Folic acid				Unknown (pH and osmolality ~physiological) (1)	-
Furosemide				No severe tissue reactions are known (pain) (high pH (8.0-9.3) and osmolality ~physiological) *(2)(10)(11)	-
Hyaluronic acid				Unknown (pH and osmolality ~physiological) *(1)	-
Hydrocortisone				Unknown (pH and osmolality ~physiological) (1)	-
Imipenem/Cilastatin				No severe reactions (pH and osmolality ~physiological) (2)(10)(11)	-
Immunoglobulin human				No severe reactions (pain and swelling) (pH range: 4.0-7.0 and osmolality ~physiological) (1)(2)	-
Infliximab				Unknown (pH and osmolality ~physiological) (1)(6)	-
Influenza vaccin				Unknown	-
Insulin				Unknown (pH ~physiological) (6)	-
Mepolizumab				Unknown (pH ~physiological) (1)	-
Mercapto-ethansulfonacid				Unknown (pH ~physiological) (1)	-
Meropenem				No severe reactions (pH and osmolality ~physiological) (2)(6)(11)	-
Methylprednisolone (acetate on Na-succinate)				No severe reactions (pH and osmolality ~physiological) (2)	-
Natalizumab				Unknown (pH ~physiological) (11)	-
Pamidronic acid				Unknown (pH ~physiological) (1)(11)	-
Pneumococcal vaccin				Unknown	-
Proflamine				Unknown (pH and osmolality ~physiological) (1)(6)	-
Ranitidine				Unknown (pH and osmolality ~physiological) (6)(11)	-
Rasburicase				Unknown (pH and osmolality ~physiological) (6)	-
Rituximab				Unknown (pH ~physiological) (11)	-
Streptokinase				Unknown (pH ~physiological) (6)(11)(13)	-
Sugammadex				Unknown (pH and osmolality ~physiological) *	-
Teicoplanin				Unknown (pH ~physiological) (1)(11)	-
Tenecteplase				Unknown (pH ~physiological) (11)	-
Tobramycin				No severe damage to tissues (pH and osmolality ~physiological) (2)	-
Tramadol				Unknown (pH and osmolality ~physiological) (6)(11)	-
Tranexamic acid				Unknown (pH ~physiological) *(1)(13)	-
Urokinase				Unknown (pH and osmolality ~physiological) (6)(11)	-
Voriconazole				Unknown (pH and osmolality ~physiological) (6)(11)	-

UNKOWN	An agent of which it is unknown what kind of injury might occur when escaping the intended vascular pathway.
Acetylcysteine	Levosimendan
Acetylsalicylic acid	Levothyroxine
Adenosine	Medroxyprogesterone
Alanyl glutamine	Metamizole
Albumin (4% and 20%)	Methylethylmethylmethane
Alfentanil	Metoclopramide
Alprostadil	Metoprolol
Anidulafungin	Milrinone
Argatroban	Nadroparin
Ascorbic acid	Nandrolone
Atosiban	Neostigmine
Betamethasone acetaat/difosfaat	Nicardipine
Biperiden	Obidoxime
Bivalirudin	Oxytocin
Botulinu, A Toxine (Botox en Dysport)	Paracetamol
Brivaracetam	Pegfilgrastim
Calcitonin	Phenol (in water)
Carbetocin	Phentolamine
Cefazolin	Physostigmine
Cefuroxime	Phytomenadione
Clemastine	Piritramide
Clonidine	Posaconazole
Clorazepate	Prilocaine
Coagulation factor VIII	Procainamide
Daptomycin	Protirelin
Deferoxamine	Protrombin complex
Dexmedetomidine	Pyridoxine
Diclofenac	Remifentanil
Droperidol	Rocuronium
Ephedrine	Somatorelin
Esketamine	Somatropin
Esomeprazole	Sufentanil
Fibrinogen	Sumatriptan
Filgrastim	Suxamethonium
Flucloxacillin	Theophylline
Flumazenil	Thiamine
Fosfomycin	Tigecycline
Gadobenic acid (Dotarem)	Tirofiban
Gadoteridol (Prohance)	Tolazoline
Gadoxetic acid (Primovist)	Triptorelin
Glucagon	Ustekinumab
Gonadorelin	Vedolizumab
Gonadotrofin	Verapamil
Granisetron	Zidovudine
Haloperidol	Zoledronic acid
Hydroxocobalamin(-2)	
Hydroxyethylstarch	
Ibutilide	
Isoniazid	
Jomeprol (Iomeron 300 en 350)	
Joversol (Optiray 300 en 350)	
Lacosamide	
Levetiracetam	
Levocarnitine	
Levofloxacin	
Levomepromazine	

REFERENCES CRASHCARD

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**	Summary of Product Characteristics Roche Canada
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