대한당뇨발학회 창립학술대회

Principles of Debridement in Diabetic Foot Infection

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1885 Chejungwon · 1904 Severance Memorial Hospital · 1913 Severance Medical School · 2005 Main building of the Severance Hospital

Introduction

Debridement is the removal of devascularized or infected tissue or foreign material from, or adjacent to, a wound with the aim of exposing healthy tissue

- Carville 2001

Principles of local wound management

SEVERANCE

Wound bed preparation

- **T** tissue viability
  - Debride non-viable tissue
  - (unless contraindicated)
- **I** infection & inflammation control
  - Look for clinical signs
  - Antimicrobials, antibiotics
- **M** moisture control
  - Dressings
- **E** edge
  - Edge characteristics
  - Edge advancement

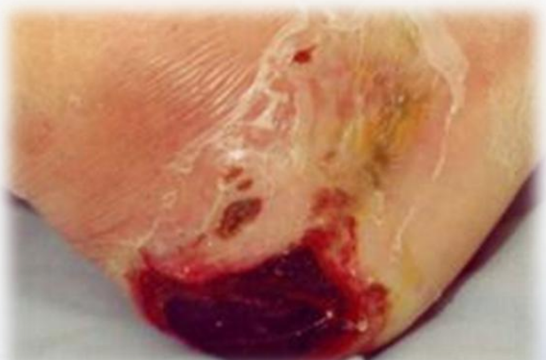
When to debride

- Some infections
- Necrotic tissue
- Eschar with separation of edges, bogginess
- Slough
- Blisters with clear fluid
  - Burst blisters must be debrided
- Foreign matter (eg. road dirt)
- Burns
- hematomas

When not to debride

SEVERANCE

- Debridement of dry necrotic tissue without separation of edges is contra-indicated where there is inadequate blood supply to support infection control & wound healing


Why debride

SEVERANCE

- Non viable tissue will inhibit wound healing by
  - ✓ Hindering adequate wound assessment
  - ✓ Slowing granulation
  - ✓ Inhibiting wound contraction
  - ✓ Preventing epithelial cell migration
  - ✓ Encouraging bacterial growth
  - ✓ Possibly causing malodour

- Removal of non viable tissue can turn a chronic wound into an acute wound
  - ✓ Removes senescent cells
  - ✓ Stimulates blood flow
  - ✓ Removes bacteria laden tissue

Methods of debridement

SEVERANCE

Surgical	Used in surgery Extends into healthy tissue
Conservative sharp	Bedside method Does not extend into nor excise healthy tissue
Autolytic	Uses dressings to achieve the optimal moisture balance to facilitate the body's processes
Mechanical	Uses force Eg. Wet-to-dry gauze, hydrosurgery, dry gauze
Biological	Use of sterile blue-bottle fly maggots Only commercially produced maggots should be used
Chemical	Use of chemicals
Enzymatic	Use of enzymes

Factors influencing method

- Extent & type of non viable tissue
- Etiology of wound
- Location of wound
- Size of wound
- Availability of resources
- Practitioner skill, experience & training
- Patient co-morbidities
- Patient wishes

Surgical debridement

SEVERANCE

- Selective & very rapid
- Uses sterile sharp instruments to remove non viable tissue
- Usually requires anesthesia
- Performed by trained surgeons
- Includes excision into healthy tissue
- Requires good control of bleeding
- Can turn a chronic wound into an acute wound
  - But, must address underlying etiology

Mechanical debridement

SEVERANCE

- Can be selective or non-selective & rapid to slow depending on method chosen
- Bedside method – anesthetic not required but analgesia may be needed as this can be a very painful method
- Uses force

  - eg. dry gauze; wet-to-dry saline soaks; hydrosurgery

    Ultrasound assisted (UAW)

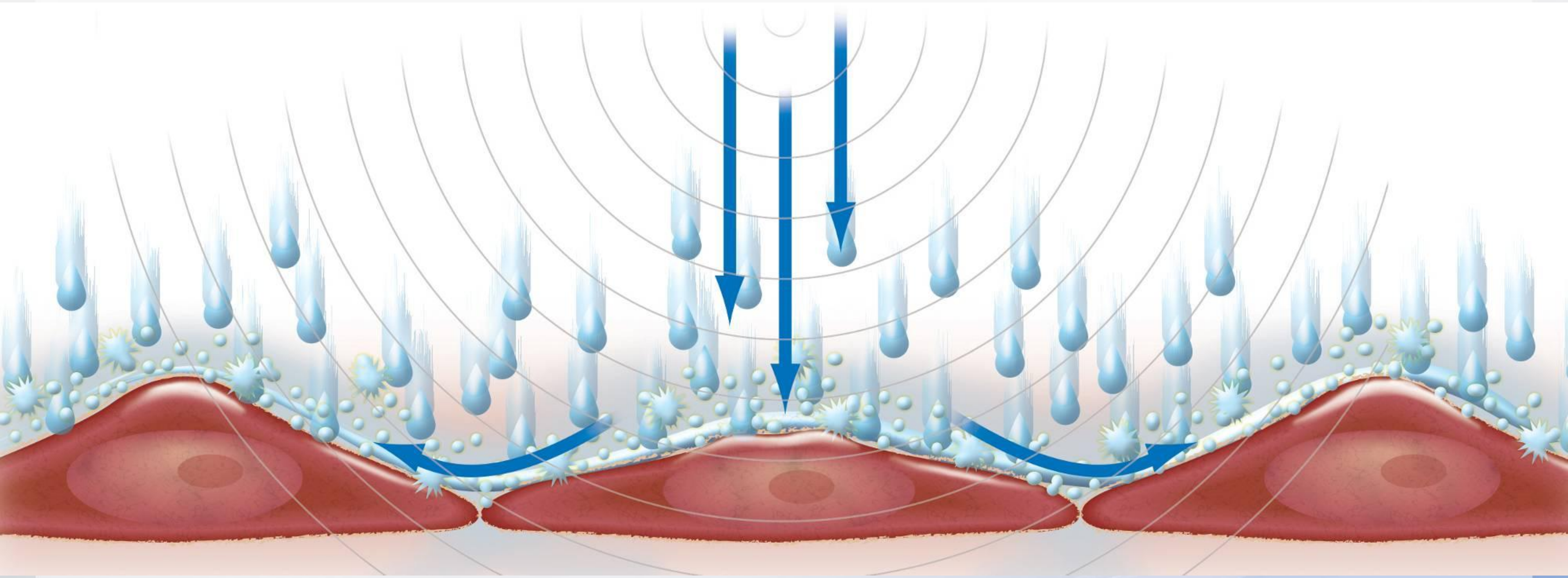
Ultrasonic assisted wound debridement (UAW)

Ultrasound Applications	High Intensity Ultrasound	Low Intensity Ultrasound
MHz High Frequency	Thermal Sports Medicine Physical Therapy	Diagnostic Imaging Fetal Monitoring
kHz Low Frequency	Debridement & Wound healing Söring (25 kHz), Misonix	

Ultrasonic assisted wound debridement (UAW)

This drawing depicts the effects of low frequency, non-contact, non-thermal ultrasound on human fibroblasts

- **Please note the cavitation on and near the cell surface**
- **Please note the acoustic microstreaming along the cell surface**



Ultrasonic assisted wound debridement (UAW)

1. **Promotes Wound Healing**
2. Promotes New Cell Growth
3. Removes Bacteria
4. Cleans & Debrides
5. Painless

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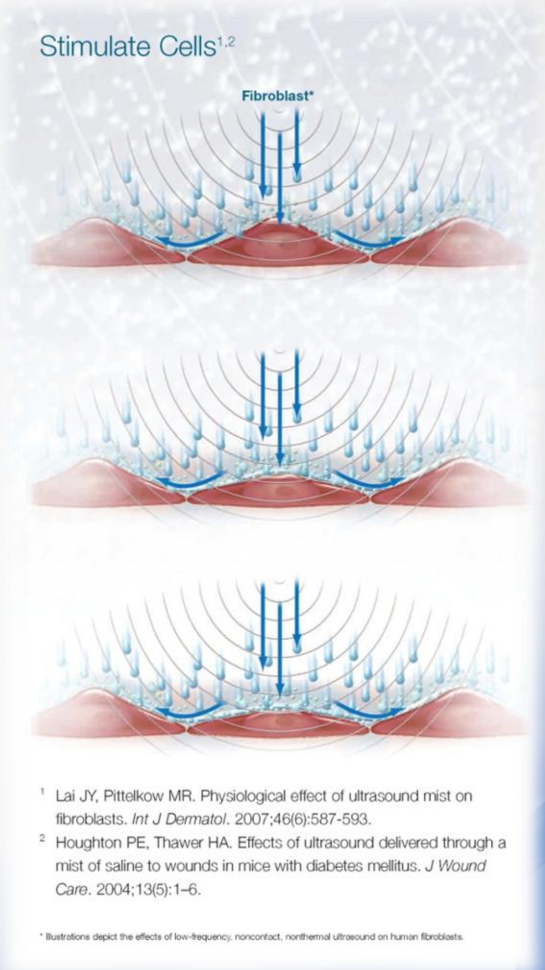

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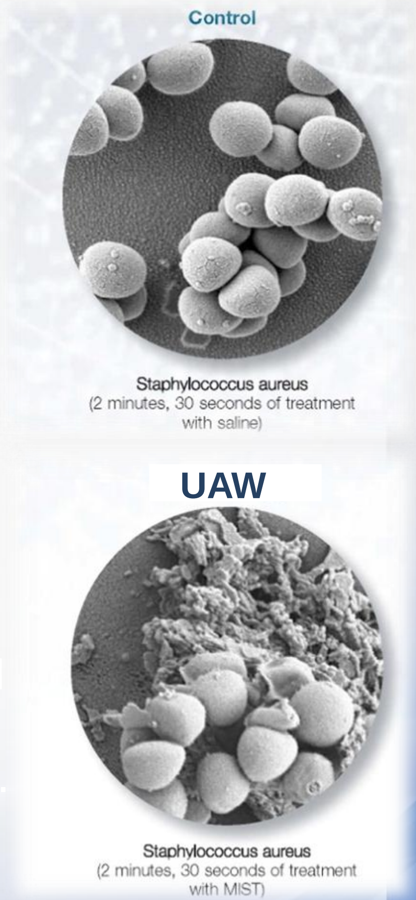
Kavros SJ, Schenck EC. Use of noncontact low frequency ultrasound in the treatment of chronic foot and leg ulcerations: a 51 patient analysis. J Am Pod Med Assn. 2007;97(2):95-101.



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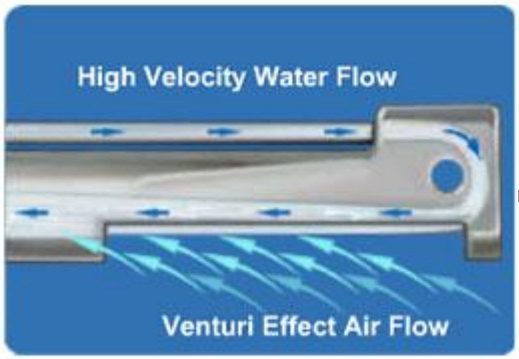

Hydrosurgery

- Hydrosurgery system uses pressurized streams of sterile fluid to cut, ablate and remove tissue & foreign matter from wounds and to resect & remove material in a variety of applications
- Allows precise & controlled debridement to varying depths that is operator controlled
- Highly selective
- Can be used for operative & bed side debridement

Autolytic debridement

SEVERANCE

- Most widely used method
- Selective & slow
- Uses dressings to facilitate the body’s natural ability to break down non viable tissue
- Creates the ideal wound environment
- Bedside procedure
- Gentle & painless

SEVERANCE

Basic contemporary dressings

ideal wound environment

Dry none	MOIST low	Wet moderate	Wet high
HYDRATION	MOISTURE RETENTION	EXUDATE MANAGEMENT	
Hydrogel	Hydrocolloid Foam	Foam	Alginate Cellulose fiber

Specialized dressings

SEVERANCE

- There are several products useful for wound debridement
  - Wet therapy (tenderwet)
  - Rapid capillary action (vacutex, advadraw)
  - High sodium (mesalt, hypergel)
  - Wound honey (medihoney gel / gel sheet)
  - Cadexomer iodine (iodosorb)

Conservative sharp debridement

SEVERANCE

- Selective & reasonably rapid
- Bedside debridement without anesthesia or local anesthesia
- Uses sterile, sharp instruments
- Does not include healthy tissue
- Usually combined with other types of debridement for optimal results
- Must have the training, skills & equipment

Biological debridement

SEVERANCE

- Selective & relatively rapid
- Uses maggots to degrade non viable tissue
- Must be correct type of maggots
  - Sterile blue-bottle fly maggots
- Practitioner training required
- Usually reserved for specialist in-patient settings

Other methods of debridement

- Chemical
  - Non selective & relatively rapid
  - Uses chemicals to break down non viable tissue
  - Not recommended d/t potential for destruction of healthy tissue & pain
- Enzymatic
  - Selective & relatively rapid
  - Uses enzymes to degrade non viable tissue

Case 1

SEVERANCE

Case 1

SEVERANCE

VAC 5 d → VAC 8 d → VAC 11 d

VAC 20 d → VAC 1 m → POD 3 m

Case 2

SEVERANCE

Case 2

Case 2

VAC 10 d

Case 2

SEVERANCE

VAC 25d

Case 2

VAC 30d

Case 2

Case 2

Case 3

Case 3

SEVERANCE

Foot & Ankle International 2011

FOOT & ANKLE INTERNATIONAL

DOI: 10.3113/FAI.2011.0031

Limb Salvage In Severe Diabetic Foot Infection

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ABSTRACT

Background: **The purpose of our study was to determine the efficacy of a management algorithm that includes negative pressure wound therapy (NPWT) in diabetic feet with limb-threatening infection.** ***Materials and Methods:*** **Forty-five septic diabetic feet were treated with NPWT between 2006 and 2008. After emergent abscess evacuation, early vascular intervention was performed if necessary. Debridement, with or without partial foot amputation, was followed by NPWT. Wound progress was measured using a digital scanner. A limb was considered salvaged if complete healing was achieved without any or with minor amputation through or below the ankle. The mean followup after complete wound healing was 17 (range, 6 to 35) months.** ***Results:*** **Thirty-two cases (71%) were infected with two or more organisms. Negative pressure wound therapy was applied for 26.2 ± 14.3 days. The median time to achieve more than 75% wound area granulation was 23 (range, 4 to 55) days and 104 (range, 38 to 255) days to complete wound healing. Successful limb salvage was achieved in 44 cases (98%); 14 (31%) without any amputation and 30 (67%) with partial foot amputations. Total number of operations per limb was 2.4 ± 1.3. One case of repeated infection and necrosis was managed with a transtibial amputation. There were no complications associated with NPWT.** ***Conclusion:*** **This study provides the outcome of**

Key Words: Diabetic Foot; Infection; Amputation; Limb Salvage; Negative Pressure Wound Therapy

INTRODUCTION

Diabetic feet, especially when accompanied by neuropathy or ischemia, are at risk for severe or extensive infection. A septic foot, defined by the presence of purulent discharge or abscess in the deep soft tissue or bone,[21] is often limb-threatening and can lead to major amputation.

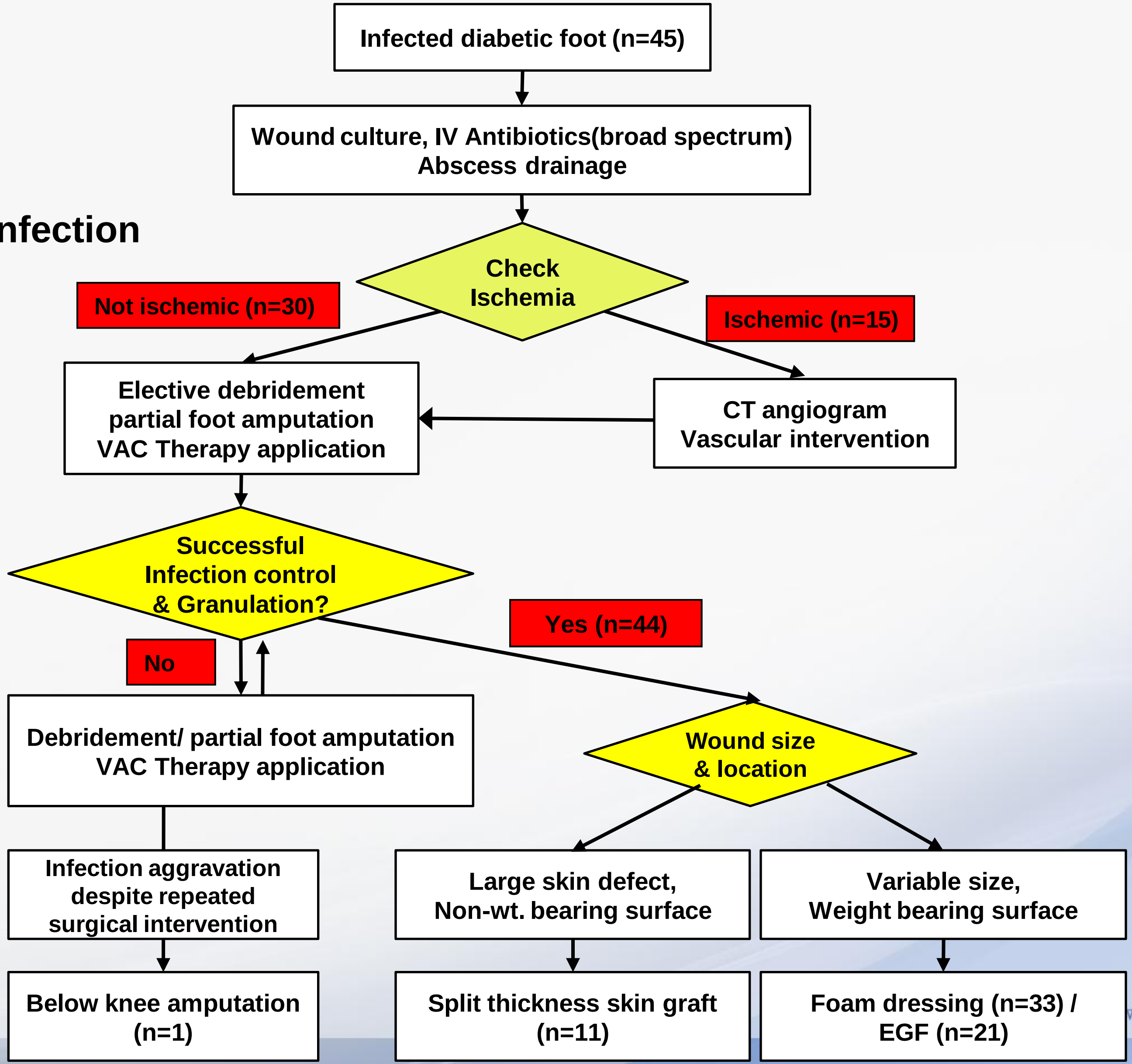
Salvaging a limb is critical because reduced activity after major amputation can cause a variety of morbidities and increased risk of mortality.[17,20] Through various multidisciplinary programs, a substantial decrease in the incidence of major amputations in diabetic patients has been achieved.[10,11] However, when accompanied by severe or limb-threatening infections, the rate is reported as high as 51%.[5,21–22]

Negative pressure wound therapy (NPWT) has proven its effectiveness in various diabetic foot problems through several randomized controlled studies.[1,4,7] Compared to standard moist gauze dressings, NPWT showed a higher proportion and rate of wound healing in diabetic ulcers,[4] cavitatious wounds,[7] and after partial foot amputation.[1]

Severance Experience

SEVERANCE

2006 ~ 2008
45 diabetic feet
with limb-threatening infection



Severance Experience

SEVERANCE

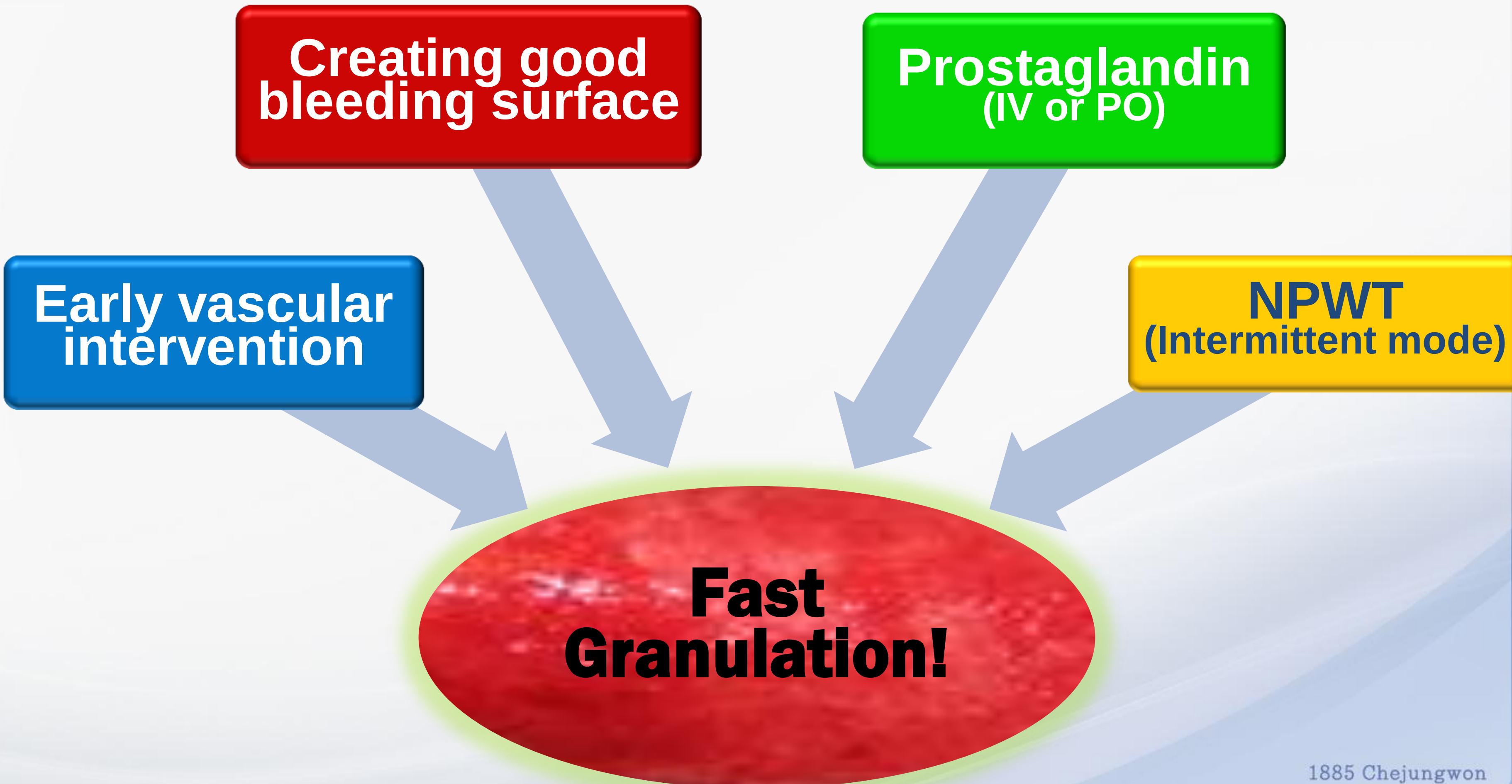
Fast granulation with repeated debridement

	Armstrong (Lancet, 2005)	Severance study (FAI, 2011)
>75% granulation	NPWT group: 42 days Control group: 84 days	23 days
Infectious status	**Non-infectious diabetic foot** (17% developed infection after NPWT)	**Septic diabetic foot**
Wound status	100%: Secondary to amputation	31%: non-amputee 69%: Secondary to amputation
Subsequent debridement	21%	100%

Severance Experience

SEVERANCE

Reasons for fast granulation



Thank you for your Attention