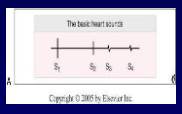
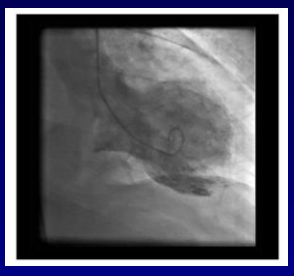
What becomes of a Broken Heart? Perioperative Cardiac Failure





INKOSI ALBERT LUTHULI CENTRAL HOSPITAL

Eric Hodgson
Inkosi Albert Luthuli Central Hospital
&
Nelson R Mandela Med School
University of KwaZulu-Natal
eThekwini-Durban

Nelson R Mandela School of Medicine

UNIVERSITY OF KWAZULU-NATAL

THE SHARKS

DECLARATION

Advisory boards

- Fresenius Kabi, Mundipharma

Speaker honoraria

- Abbvie, Adcock-Ingram, Baxter, Astra-Zeneca, Mundipharma, Pfizer, Fresenius Kabi, GSK, Janssen-Cilag, Aspen

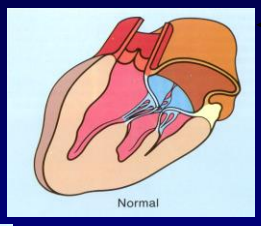
Thanks to SASA & UKZN for Travel Support

Adverse Cardiac Remodeling

Dilated cardiomyopathy

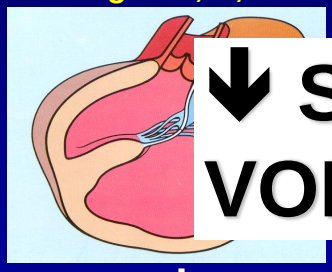
Stage A

Hypertensive or diabetic heart disease

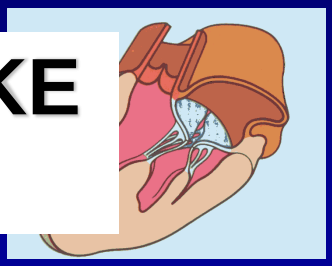


Stages B, C, D

Stages B, C, D



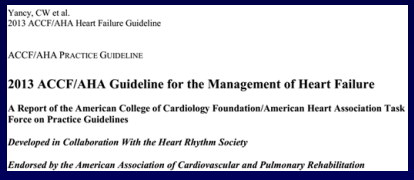
↓ STROKE VOLUME



↑LV cavity, ↓Myocytes
Systolic LV dysfunction
↓ Ejection Fraction

↓ LV cavity, ↑Myocyte size
Diastolic dysfunction
Preserved Ejection Fraction

Systolic HF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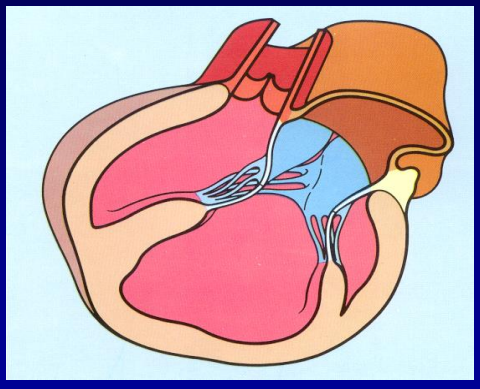
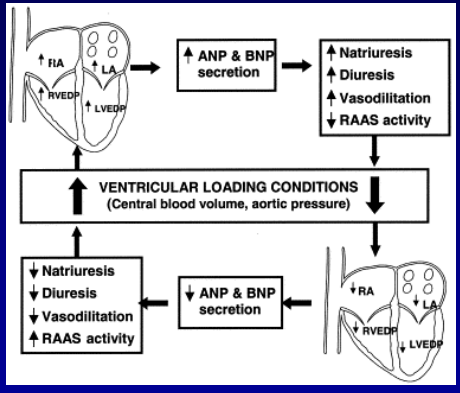


↑LV cavity, ↓Myocytes
Systolic LV dysfunction
↓ Ejection Fraction

Systolic CCF

Systolic heart failure: Chronic and acute syndromes
Crit Care Med 2008 Vol. 36, No. 1 (Suppl.)
Kanu Chatterjee, MB, FRCP, FCCP, FACC, MACP; J. Eduardo Rame, MD, MPhil

- ↑Preload / ↓EF
  - Dilated / Myopathic LV
- ↓Renal blood flow
  - RAS activation
  - ↑BV / TBW / Na^+
- Pathophysiology
  - Progressive ↓ METs
  - Creps = Shunt



Perioperative Systolic CCF

Circulation
Journal of the American Heart Association
American Heart Association. Learn and Live.
ACC/AHA 2007 Guidelines on Perioperative Cardiovascular Evaluation and Care for Noncardiac Surgery: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 2002 Guidelines on Perioperative Cardiovascular Evaluation for Noncardiac Surgery): Developed in Collaboration With the American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, and Society for Vascular Surgery
Lee A. Fleisher, Joshua A. Beckman, Kenneth A. Brown, Hugh Calkins, Elliott Chaikof, Kirsten E. Fleischmann, William K. Freeman, James B. Froehlich, Edward

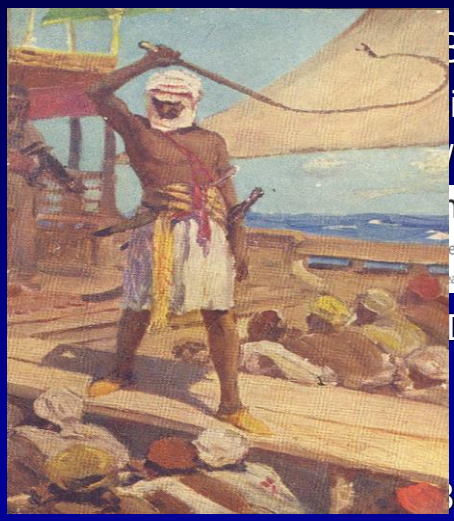
- History: METs
- Examination: Creps
- ECG: Qs, Arrhythmias
- BNP: >87.5 pg/ml^{-1}
- 6 minute walk: 200-400m: More tests
  - NOT Treadmill
- Dobutamine Stress Echo: ?Responsive

British Journal of Anaesthesia 107 (2): 144–9 (2011)
Advance Access publication 24 May 2011 · doi:10.1093/bja/aer119
BJA
CARDIOVASCULAR
B-type natriuretic peptide predicts long-term survival after major non-cardiac surgery
C. J. Poyne[1,2*], S. C. Gibson[1], G. Bryce[1], A. G. Jordine[2], C. Berry[2] and D. B. Kingsmore[1]

Adverse effects of Inotropes

Christian A. Schmittinger
Christian Torgersen
Günter Luckner
Daniel C. H. Schröder
Ingo Lorenz
Martin W. Dünser

Adverse cardiac events during catecholamine vasopressor therapy: a prospective observational study



3%

iated with mortality

/ Duration

ner nail in the hammer's coffin?

er* and David Brealey

arch by Shahin *et al.*, http://ccforum.com/content/15/4/R162

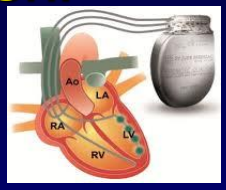
Dialysis 2.7x

3 hours max

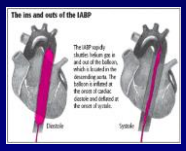
Effective Therapy for SHF

Anesthetic considerations for the patient undergoing therapy for advanced heart failure
Scott A. Falk

Curr Opin Anesthesiol 24:314–319
© 2011 Wolters Kluwer Health | Lippincott Williams & Wilkins
0952-7907



- **Cardiac Resychronisation**
  - **Triple chamber pacing**
- **IABP**
  - **Improves perfusion**
- **LVAD**
  - **Extra- vs. Intra-corporeal**
  - **Anticoagulated**
- **Transplant**
  - **Recipient & Donor criteria**
  - **No Transplant = End-stage OSF**



Diastolic HF

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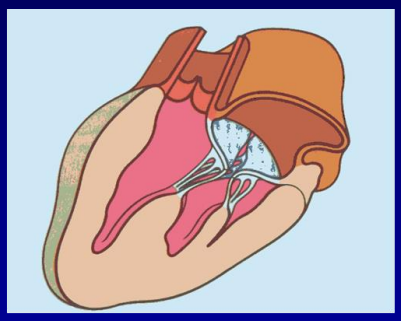


↓ LV cavity, ↑Myocyte size
Diastolic dysfunction
Preserved Ejection Fraction

Case report

- 74 year old man
  - 60 pack year smoker
  - Hypertensive on Enalapril
    - Poor compliance
    - Admission BP 180/100
- Acute appendicitis
  - Resected laparoscopically
  - Uneventful anaesthetic

Case report

- Day 3 postop
- Acutely dyspneic

- CXR as shown
- ECG: T-wave changes

- Pro-BNP: 5 000
- Next?

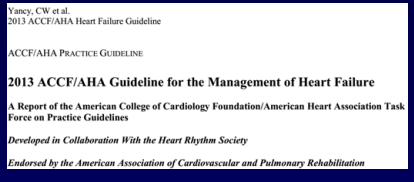
Case report

- ECHO by (invasive) cardiologist
  - EF 54%: NOT Cardiac
  - Lasix 80mg BD
- Progressive deterioration
  - Started on steroids
  - NIV: FiO_2 1 / 10 / 5
- Pro BNP 7 000 Urea: 7
- Treatment?

Case report

- EoL counselling
- Stop Lasix
- Labetalol
  - 25 – 50mg/hr
- Enalapril recommenced
- Atenolol added
- Next morning
  - Off Labetalol
  - Eating breakfast

Diastolic HF



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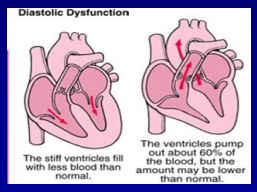
↓ STROKE VOLUME

↓ LV cavity, ↑Myocyte size
Diastolic dysfunction
Preserved Ejection Fraction

Diastolic HF

Perioperative Assessment of Diastolic Dysfunction
Robina Matyal, MD,* Nikolaos J. Skubas, MD,† Stanton K. Shernan, MD,† and Feroze Mahmood, MD*
September 2011 • Volume 113 • Number 3 anesthesia-analgesia.

- 50% of cases of CHF
  - BP: ↑ / **N** EF: maintained
- >50% of those >70



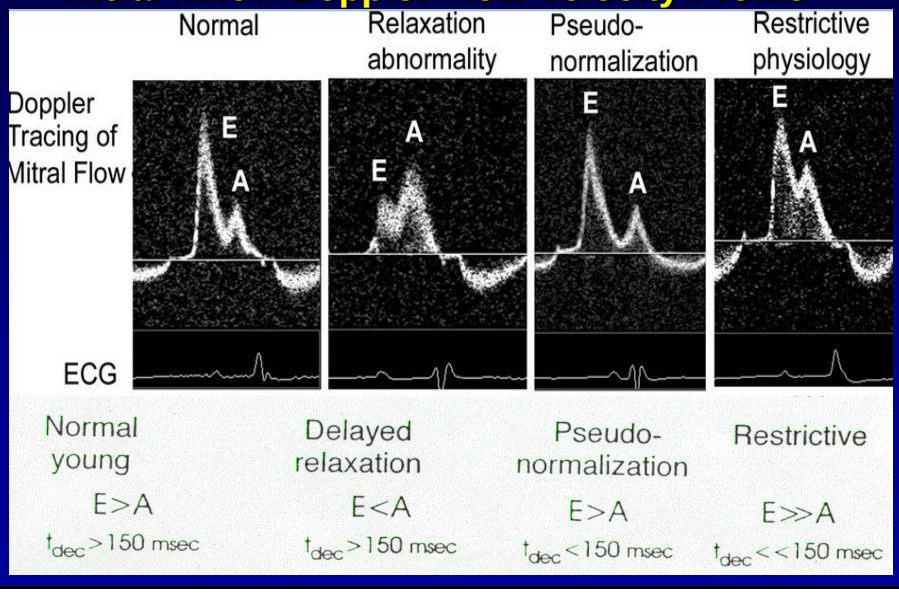
- Pathophysiology
  - ↓ Stroke Volume
  - ↑Pulmonary Venous & Capillary pressures
  - Dyspnea: Threshold vs. Progressive

Left Ventricular Relaxation

- **LV Hypertrophy**
  - **Hypertension - IHD**
- **Asymptomatic**
  - **↓Early filling (lusitropy) compensated by**
  - **↑ Atrial contraction**
- **Slow worsening → Stress → Decomp**
- **Stress**
  - **Surgery - Sepsis - Arrhythmia**

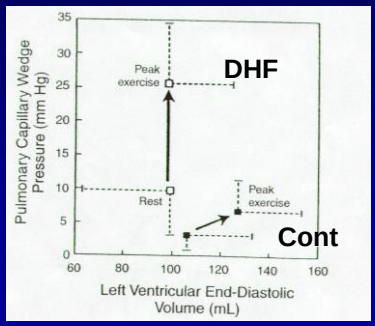
Diastolic Dysfunction

Mitral Inflow Doppler Flow Velocity Profile



DHF pathophysiology

- Fixed Cardiac output
  - NO ↑ SV by Frank-Starling mechanism
  - Severely increased LV filling pressure
- Exercise intolerance
  - Vicious cycle
  - ↓ cardiac output
  - ↓Diastoly
  - ↓ Myocardial perfusion
  - ↓↓↓Relaxation
  - ↑↑↑LV – Pulm Vein pressure
- Flash Pulmonary Oedema



DHF Clinical Features

Defining Diastolic Heart Failure and Identifying Effective Therapies

John G. F. Cleland, MD, PhD, FRCP
Pierpaolo Pellicori, MD

JAMA, February 27, 2013—Vol 309, No. 8 825

- Exercise intolerance
- Systemic hypertension
- Pulmonary oedema WITH
  Normo- / Hypertension
- Apex assessment
  - DHF: Minimal displacement
    Easily palpable: Heaving
  - SHF: Marked displacement
    Poorly palpable: Diffuse

Rapid Assessment of Hemodynamic Status

Congestion at Rest

Low Perfusion at Rest	NO	YES
NO	Warm & Dry	Warm & Wet 67%
YES	Cold & Dry 5%	Cold & Wet 28%

Nohria,J Cardiac Failure 2000;6:64

Perioperative Diastolic CCF

- ECG: Qs, Strain
- BNP: >87.5 pg/ml^{-1}
- Troponins Significant postop
- 6 minute walk: 200-400m: More tests
  - NOT Treadmill
- Dobutamine Stress Echo: ↑ Pulmonary VP

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Anaesthesia
Journal of the Association of Anaesthetists of Great Britain and Ireland

REVIEW ARTICLE
B type natriuretic peptide – a diagnostic breakthrough in peri-operative cardiac risk assessment?
R. N. Rodseth

Association Between Postoperative Troponin Levels and 30-Day Mortality Among Patients Undergoing Noncardiac Surgery
The Vascular Events In Noncardiac Surgery Patients Cohort Evaluation (VISION) Study Investigators
JAMA. 2012;307(21):2295-2304

Treatment of DHF

- Cardiac vs. Vascular
- Decongestion
  - ↓LVEDP: β-Blocker
    Nitrate → ACEI / ARB
- Diuretic 3RD LINE
  - Very limited role in perioperative period

Diastolic Dysfunction, Cardiovascular Aging, and the Anesthesiologist
Anesthesiology Clin 27 (2009) 497–517
David Sanders, MD, Michael Dudley, MD, Leanne Groban, MD*

Dangers of diuretic use

Rational Use of Diuretics in Acute Decompensated Heart Failure

Jason A. Goebel, MD, and Adrian B. Van Bakel, MD, PhD

- Persistent / Worsening symptoms
  - ↓Preload - ↓Filling - ↓Output
  - Persistent congestion
    - ↑CVP/JVP ↑Urea
- Renal failure
  - ↓Perfusion
- Myocardial Infarction
  - Compensatory tachy

Spironolactone

- Aldosterone antagonist, K-sparing diuretic
- Prevention of aldosterone effects on:
  - Kidney Heart
- Aldosterone inappropriately elevated in CHF
- Mobilizes edema fluid in heart failure
- Prevention of hypokalemia
- Prolongs life in CHF patients

Treatment of DHF

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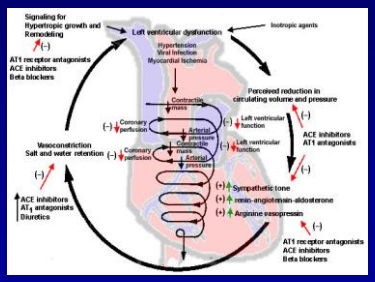
  - ↓LVEDP: Labetalol → β-Blocker
    Nitrate → ACEI / ARB
    Diuretic 3RD LINE
- Identify and treat CAD
  - Aspirin ± Clopidogrel
  - Revascularisation
- Lifestyle Modification
  - Diet Smoking Statins
- Treatment effective vs. SHF



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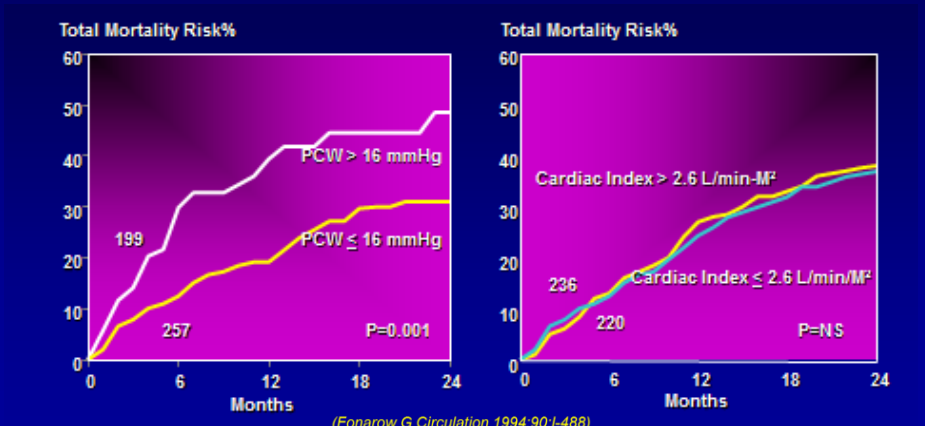
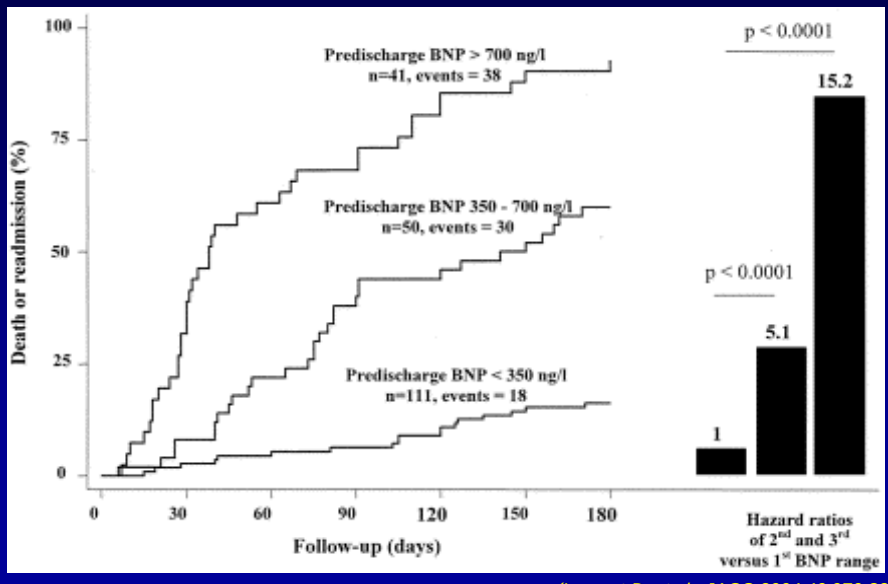


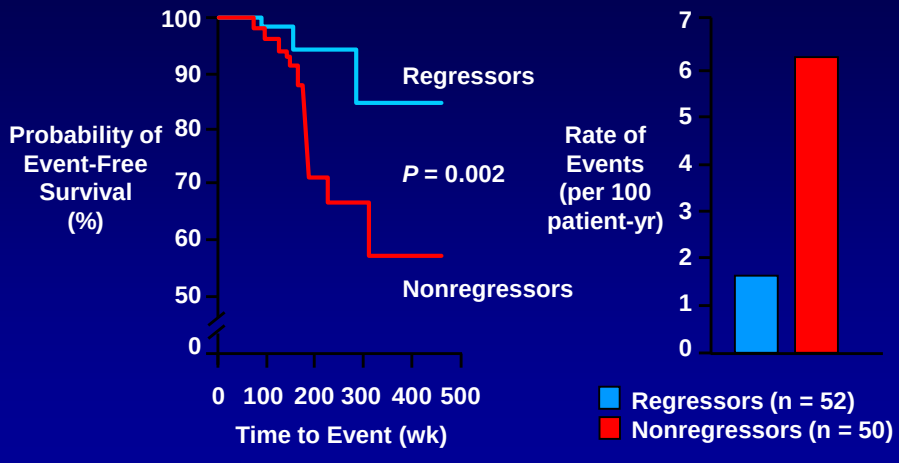
(Fonarow G Circulation 1994;90:I-488)

BNP Levels Pre-discharge Predict Mortality and Readmisssion



(Logeart D, et al. JACC 2004;40:976-82)

Regression of Left Ventricular Hypertrophy (LVH) Predicts Prognosis



Nonregressors defined as baseline and follow-up left ventricular mass index (LVMI) > 125 g/m^2; regressors defined as baseline LVMI > 125 g/m^2 and follow-up LVMI < 125 g/m^2.
Verdecchia P et al. *Circulation.* 1998;97:48-54.

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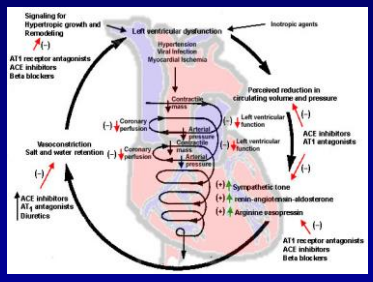

- DELAY surgery for Rx

Anaesthesia and HF

Anesthesiology 2008; 108:551–2 Copyright © 2008, the American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins, Inc.

Implications of Preoperative Heart Failure

The Next Frontier in Perioperative Medicine?

- Diagnosis: esp. DHF
- Perioperative intervention
  - Selective β-blockade – NOT Preop
  - Intra-op Opioids / Labetalol
- Post-op follow-up
  - Ensure compliance
  - Reinforce lifestyle changes
- Decide BUT Be prepared to be wrong!!

Takotsubo Cardiomyopathy

Fares Alahdab, MD[1], Suresh Sharma, MD[2], and Jonathan Freeman, MD[2]

J Gen Intern Med
DOI: 10.1007/s11606-013-2756-y
© Society of General Internal Medicine 2014

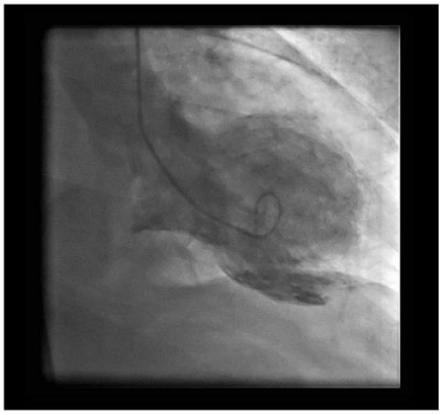

Figure 1. Left ventriculography revealed a severely hypokinetic apex and mid to distal anterolateral and inferior wall segments, but hyperdynamic basal segments.

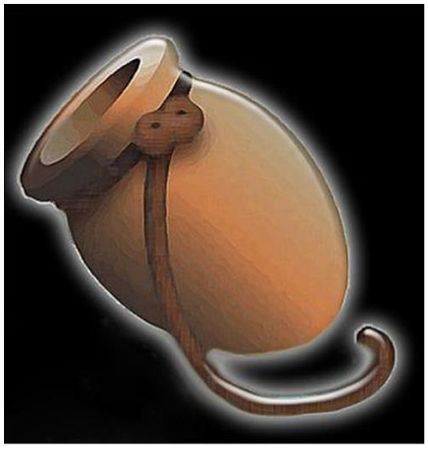

Figure 2. Representation of a Japanese octopus trap.

Slides and references

iti20178@mweb.co.za