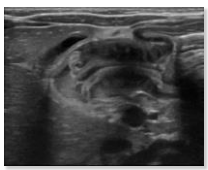
US of the Pylorus

Keith VanHaltren



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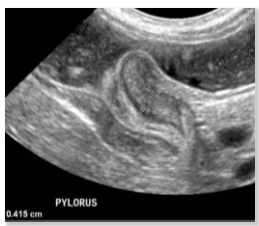
Pylorus: Overview

- Background
- Ultrasound
  - Scanning technique
  - Dynamic assessment
  - Measurements
- Borderline HPS
- Treatment



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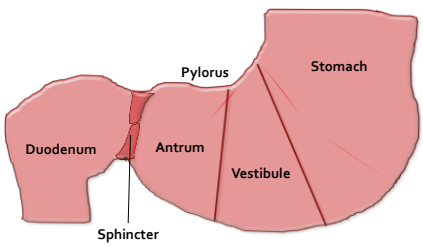
Pylorus: Anatomy



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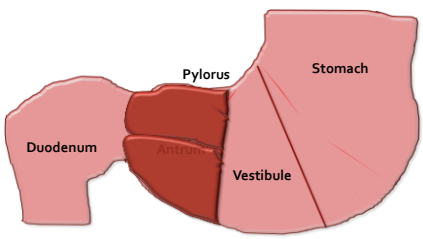
Pylorus: Anatomy



- Hypertrophic Pyloric Stenosis (HPS)
- Hypertrophy of the smooth (circular) muscle
  - Obstruction of the canal

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Pyloric Stenosis: Background

- Infants 2 - 12 weeks
- Males > Females (4:1)
- 2-5 per 1000 live births (western world)

(Hernanz-Schulman, 2009)

- Aetiology
  - Still poorly understood
  - Multifactorial (genetic & environmental factors)
  - primiparity
  - 2 – 4 fold increased incidence when bottle fed

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Pyloric Stenosis: Symptoms

- **Projectile vomiting**
  - non bilious
  - after every feed
- Clinical examination
  - palpable mass ('olive')
- Weight Loss (malnutrition)
- Dehydration
- Hypochloraemic metabolic alkolosis

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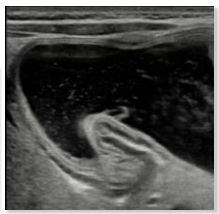
Pyloric Stenosis: U/S Technique

- Micro convex transducer (C9-4)
- High frequency linear transducer (L18-3)
- Feed baby sterile water
  - ~30ml
- Warm gel



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Ultrasound Technique: Patient position

- **Supine**
- **Left side up**
  - Fluid in stomach provides a good acoustic window
  - Promotes gastric emptying
- **Right side up**
  - Use if stomach is over distended
  - Allows pylorus to move anteriorly

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Ultrasound Technique: Visualisation

- Transducer orientated transverse in ML
  - Slight rotation gives long axis of pylorus
- Gentle sustained pressure
- Pyloric antrum
  - Medial side of stomach
  - Adjacent to GB

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Ultrasound Technique: Visualisation tip

- Gastro-oesophageal junction
  - If heart in view – likely to be incorrect

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Pylorus: U/S Assessment for HPS

- Muscle wall thickness
- Length of closed canal
- Transit of fluid through pylorus

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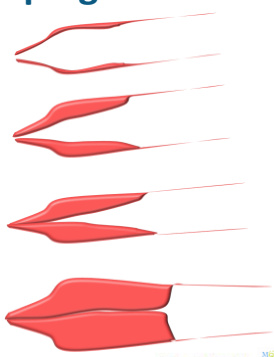
Pylorus: Developing HPS

- Clearly normal
- Borderline
- Clearly abnormal



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Pylorus: U/S Assessment for HPS

- Muscle wall thickness
- Length of closed canal
- Transit of fluid through pylorus

Pylorus - Examined (No / Yes) Sterile Water(injection) (Yes / No) Hypertrophic pyloric stenosis : (Yes / No / Equivocal)
Pylorus Length..... (mm) Wall thickness ..... (mm) *(*Length > 17mm abnormal Wall thickness > 3mm abnormal)*
Transit of fluid: Comment.....

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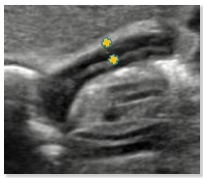
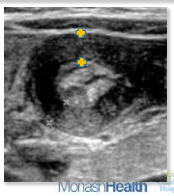
U/S Measurement: Muscle wall Thickness

- **Muscle wall thickness**
  - True mid longitudinal plane (or transverse)
  - Hypoechoic muscle
  - Most reliable measurement





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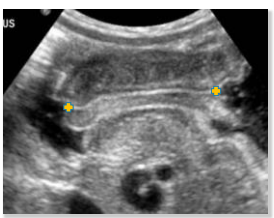
U/S Measurement: Length

- **Length (canal)**
  - True mid longitudinal plane (Like a cervix measurement)
  - Less reliable



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Ultrasound: Dynamic Assessment

- **Normal**
  - Gastric peristalsis
  - Pylorus opening
  - Passage of fluid
  - 15mins

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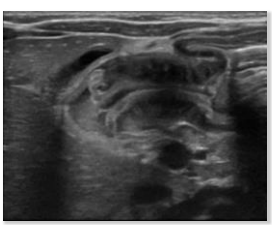
Ultrasound: Dynamic Assessment

- **Abnormal**
  - Pylorus fails to relax and open
  - Very little or no passage of fluid
  - Exaggerated peristaltic waves



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Pyloric Stenosis: Abnormal U/S Criteria

- **Muscle wall thickness ≥ 3mm**
  - Sensitivity 91%, Specificity 85%
- **Pyloric muscle length ≥ 17mm**
  - Sensitivity 76%, Specificity 86%

(Forster et al, 2007)

- **Actual numeric value is less important than overall morphology of the canal and real time / dynamic observations**

(Hernanz-Schulman 2003)

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Pyloric Stenosis: Muscle wall thickness

- **≥ 3mm**
  - Abnormal
  - Hypertrophic Pyloric stenosis
- **< 2mm**
  - Normal
  (O'Keeffe et al, 1991)
- **2-3mm**
  - Borderline

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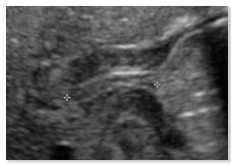
Pyloric Stenosis: Borderline HPS

- **2-3mm**
  - Can become abnormal (10 – 30%)
  (Forster et al, 2007) (Okeeffe et al 1991)
  - Particularly < 3 weeks age
  - Premature infants
  - Low bodyweight
  - **Pyloric stenosis develops / evolves over time**
  - Consider repeat study in 2-5 days



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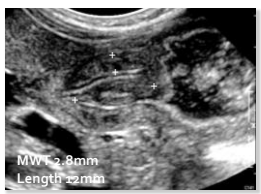
Borderline HPS: Case Study

- 3 week old boy
- Presents to ED vomiting after every feed
- Initial ultrasound
  - Borderline
- Admitted to ward



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Borderline HPS: Case Study

- Repeat ultrasound
  - Progressed to HPS
  - Surgery

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Borderline HPS: Case Study 2

- 14.3mm length
- 4.2mm muscular wall thickness
- Minimal transit of fluid
- Surgery based on wall thickness
- **Confirmed HPS at surgery**

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U/S Assessment: Something to consider

- **Pylorospasm**
  - <2mm muscle
  - However elongated canal and / or no passage of fluid

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Pyloric Stenosis: Treatment

- Ramstedt pyloromyotomy (1912)
- Longitudinal splitting of muscular layer without suturing
- Surgical or laparoscopic approach

Surgical Endoscopy
https://doi.org/10.1007/s00464-018-6060-0

Trends and surgical outcomes of laparoscopic versus open pyloromyotomy

William C. Kethman[1] · Alex H. S. Harris[1] · Mary T. Hawn[1] · James K. Wall[2]

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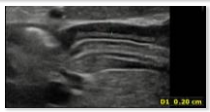
Pyloric Stenosis: Take home messages

- Muscle wall thickness is the most reliable measurement
- Good transit of fluid through the pylorus
- Be aware of developing HPS
  - Repeat study



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