Nursing considerations in Selective Internal Radiation Therapy

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What is Selective Internal Radiation Therapy?

• Treatment of unresectable liver disease

• Two step process:
  – Mapping
  – Treatment

• AKA “Radioembolization”

• Clinical trials date back to 1960!
Selective Internal Radiation Therapy

- Targeted delivery of $\beta$-radiation to liver metastases

- $Y$-90 shrinks the metastatic tumor, decreases tumor burden

- Spares surrounding healthy liver tissue
Selective internal radiation therapy (SIRT)

Liver
Tumour
SIRT beads
Blood vessel
Catheter
SIRT Treatment Algorithm

Patient Selection

1-2 weeks

Tumor Mapping → Labs

Vessel Mapping → Vessel Embolization → CT/Hepatic Angiogram *

Lung Shunt Breakthrough Scan

1-2 weeks

Review → Treatment Plan → Dosimetry → Ordering

Labs → SIR-Spheres microspheres Delivery → Bremsstrahlung Scan *

Post Treatment Care

Follow Up

*optional
Candidates for SIRT

- Non-resectable liver-dominant metastatic disease
- Past chemotherapy treatment
- ECOG performance scale score 0-2
Candidates for SIRT

- Bilirubin < 2.0 mg/dL
- Patent portal vein
- At least 3 months life expectancy
# ECOG Performance Status

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>Fully active, able to carry on all pre-disease performance without restriction</td>
</tr>
<tr>
<td>1</td>
<td>Restricted in physically strenuous activity, but ambulatory and able to carry out work of a light or sedentary nature, e.g., light house work, office work</td>
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<tr>
<td>2</td>
<td>Ambulatory and capable of all self care, but unable to carry out any work activities. Up and about more than 50% of waking hours</td>
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<tr>
<td>3</td>
<td>Capable of only limited self care, confined to bed or chair more than 50% of waking hours</td>
</tr>
<tr>
<td>4</td>
<td>Completely disabled. Cannot carry on any self care. Totally confined to bed or chair</td>
</tr>
<tr>
<td>5</td>
<td>Dead</td>
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*Adapted from Oken, et al. 1982*
Conscious Sedation

Fentanyl

Versed
Contrast Allergy

Lasser Protocol

- Prednisone 50mg po
  -13 hrs
  -7 hrs
  -1 hr
  before contrast injection

- Benadryl 50mg IV, IM 1 hr prior to contrast injection

Greenberger Protocol

- Hydrocortisone 200mg IV 1 hr before contrast injection

- Benadryl 50mg IV, IM 1 hr prior to procedure (optional)

ACR Manual on Contrast Media, 2013
SIRT MAPPING

• Mapping is performed prior to treatment
  – Estimation of shunting risk

• Angiogram

• Embolization of extrahepatic arteries

• Difficult anatomy
PRE-OP (Mapping)

• Pre-op scans:
  – CT of chest/abdomen/pelvis
  – Pet Scan

• Labs
  – CBC
  – Comprehensive Metabolic Panel
  – Tumor markers if indicated
  – COAGS: INR, PT, PTT

• Baseline EKG
PRE-OP (MAPPING)
Nursing Considerations

• No pre-medication is required for the mapping

• Foley catheter not required

• Supine

• Assess the femoral pulse
Initiating Access
INTRA-OP (MAPPING)
Nursing Considerations

- Palpate & mark bilateral dorsalis pedis and posterior tibial pulses prior to procedure
- Apply sequential compression device to extremities
- Application of patient warming device
- Always assess for contrast allergy!
Tc-99m-MAA MAPPING

- Estimates risk of shunting
- Half life of 6.02 hours
- Prepared from albumin
- 2-4 mCi Tc-99/MAA injected
- Time Sensitive
POST-OP MAPPING
Nursing Considerations

• Assess groin for hematoma and pulses for perfusion
  – Determine success of closure device
  – Apply dressing as indicated

• Post SPECT scan within 1 hour
  – Single Proton Emission Computed Tomography Scan

• Lung Shunt < 20%

• Scan determines dose of $^{90}$yttrium for treatment
90yttrium

- Beta emitting, radioactive isotope
- Half-life 64.1 hours
- Y-90 travels through the bloodstream by way of the hepatic arteries and into the liver
- Most of the radiation is delivered over the first 2 weeks of implantation
# Therasphere® vs. SIR-sphere®

<table>
<thead>
<tr>
<th>Therasphere®</th>
<th>SIR-spheres®</th>
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<tbody>
<tr>
<td>MDS Nordion</td>
<td>Sirtex Medical Ltd.</td>
</tr>
<tr>
<td>Toronto, Canada</td>
<td>Sydney, Australia</td>
</tr>
</tbody>
</table>

**Glass Microspheres**

**Resin Microspheres**

**HCC**

**Metastatic Colon Cancer**

1.2 million spheres per tx

60 million spheres per tx

1 high pressured bolus

Multiple aliquots
Pre-Op (Y-90)
Nursing Considerations

• Treatment is normally scheduled 2 weeks following the mapping

• Health Physics staff and radiation safety members should be present

• Personal Protective equipment for staff
  – Double shoe covers
  – Double gloves
  – Floor drapes
Pre-Op (Y-90)
Nursing Considerations

• Patients should start proton-pump inhibitor 5 days prior to procedure

• Insertion of foley catheter

• IV medications
  – Zofran® (ondansetron) 4 mg IV once
  – Dexamethasone® (Decadron) 20 mg IV once
  – Ancef® (Cefazolin) IV 1 gm once
  – NS 0.9% @ 150 ml/hr pre-hydration

• T-bilirubin < 2.0 within 2 weeks of the procedure
INTRA-OP (TREATMENT)
Nursing Considerations

- Treatment 60-90 minutes

- Monitor patient
  - Pain
  - Urine output
  - Changes in oxygen saturation
  - Monitor blood sugar Q2h: IDDM

- Use of intra-arterial nitroglycerin
  - Nitroglycerin 5000 mcg / 100 ml D5W
  - Increments of 25 mcg-200 mcg
Treatment Time...
Post-Op (Y-90)
Nursing Considerations

• Bremsstralung Scan within 30hrs of treatment
  – Evaluates distribution of microspheres

• PACU stay
  – 2-3 hours post treatment
  – Groin assessment
  – Accessed extremity straight for 2 hours (closure device)
  – Accessed extremity straight for 4 hours (manual pressure)
  – Treatment of post-op symptoms
Post-Op (Y-90)

Side Effects

• Patients may experience post radioembolization syndrome
  – Fever
  – Lethargy/Fatigue
  – Nausea and abdominal pain

• Discharged home the same day!
Prescriptions & Follow-up
Prescriptions

Nursing Considerations

• Proton Pump Inhibitor for 4 weeks
  – Omeprazole® (Prilosec), Pantoprazole® (Protonix)

• Zofran® (Ondansetron) 4 mg q6h po PRN

• Methylprednisolone® (Medrol) dose pack

• Oxycodone® (Oxycontin) 5 mg po q4h prn
Radiation Safety

- Y-90 microspheres are beta-radioactive sources
  - Small amount of radioactivity around the liver
  - Blood, urine, stool and vomit must be properly disposed of during the first 24 hrs
  - Y-90 half life is about 64 hours
Radiation Safety

• Patients do NOT need to restrict close contact with family members

• Men should sit when voiding for the first 24 hours

• Hand washing after using the bathroom

• Wipe and flush any bodily fluid spills
Radiation Safety

- Instruct patients if they need to go to the physician, emergency dept or have surgery within 3 days of treatment to notify medical staff that there is a small amount of radiation in the liver.
Follow-up

• Within 6-8 weeks post-treatment:
  – PET Scan
  – CT SCANS (chest/abdomen/pelvis)
  – Triple Phase Liver CT
Complications

• Gastric or duodenal ulceration

• Radiation Pneumonitis

• Radiation Hepatitis

• Acute pancreatitis/cholecystitis
CASE STUDY #1
Case Study: Gastric Ulceration

Background

• 63 year old male patient

• Original diagnosis: Rectosigmoid adenocarcinoma

• Low anterior resection performed w/o complications
Background continued..

- Additional mets to segment 7 & 8 of the right lobe of the liver were discovered on imaging.

- Successful resection and subsequent chemotherapy.

- Disease free: 18 months.
Background Continued..

- Just shy of 3 years from original dx, recurrence of inoperable asymptomatic hepatic-isolated disease

- Patient and team decided on SIRT treatment
SIRT MAPPING & TREATMENT

• During mapping, gastroduodenal artery (GDA) was coil embolized to prevent flow to the bowel because the GDA was in close proximity to the left hepatic artery

• 10 days after mapping, treatment was performed with whole liver implantation of Y90 SIR-Spheres

• Pt discharged and took omeprazole 20mg BID
Complications Arise

• 17 weeks following SIRT treatment, pt presented to the ED with the following symptoms:

  – Melena
  – Increasing lethargy x 3 Days
  – Presyncope
Pyloric Ulceration

- Patient continued to experience significant upper GI bleeding

- Non-healing pyloric ulceration

- Palliative Partial Gastrectomy performed

- Missed accessory right gastric artery
Gastrectomy specimen

Sjoquist K M et al. The Oncologist 2010;15:830-835
Post-Gastrectomy:

• Progression of intra-hepatic disease

• ECOG status score = 3

• The patient succumbed to his illness and died 32 weeks after his SIRT treatment
Nursing Considerations - Ulceration

Monitor patients for signs of:

- Nausea/vomiting
- Epigastric discomfort
- Anorexia
- Melena
Preventative measures

• Meticulous mapping by physician

• Monitor for s/s of ulceration
  – Patient education

• Continue on proton pump inhibitor as prescribed
CASE STUDY #2
Radiation Pneumonitis

- Radiation Pneumonitis is a rare complication

- $^{99m}$Tc used to evaluate & assess tumor induced arteriovenous shunting to lung parenchyma

- Hepatopulmonary Shunt Fraction < 20%
Case Study: Radiation Pneumonitis

• 50 y/o male

• Diagnosed with GIST tumor, 2001

• Shunt fraction > 20%

• Treated twice over a 4-month period with glass microspheres
Case Study Continued..

• Cumulative radiation dose to lungs: 31.0 GY ± 13.0

• 3 weeks post-op: dyspnea & chest tightness

• New bilat ground-glass opacities
Radiation Pneumonitis
RP Treatment: Corticosteroids

- Initially treated with: oral prednisone 40mg/day
- 4 weeks later, symptoms worsened
- No infectious etiology with rapid pulmonary fibrotic changes
- IV Methylprednisone 500 mg BID x 3 days
  - Eventually tapered off steroids over 2 month period
  - Home O2
Signs & Symptoms
Nursing Considerations

• Usually occurs 1-2 months after therapy

• Educate patients to report any of the following symptoms:
  – Non-productive cough
  – Dyspnea
  – Fever
A Look at the Future..

- 37,000 doses of Y-90 have been given since mid 2013
- 12.9 month prolongation of life after SIRT with metastatic colorectal cancer
- SIRT: decreasing size of HCC lesion to allow for liver transplant or resection
“After SIRT I was told that all of my liver tumours had disappeared. Life’s begun again!”

Brian’s story

“My last scan has shown that my liver tumours and liver has reduced in size.”

Jeffrey’s story

“I’m feeling good and they say that the way you feel is an indication of what’s going on inside.”

Sarah’s story
References

Please feel free to contact me for a list of references

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