Use of PCA devices in Difficult Populations

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September 10, 2011

PCA technology? Why Bother?

- Costly
- Nurses complain: time consuming
- Surgeons complain: increase length of stay
- Patients complain: doesn’t work for me

Disadvantages of PCA use

- Patient variability may make optimal dose size and lock out time difficult to determine
- People push buttons for many reasons
- Opioids are readily available and patient may attempt to tamper with device
- Patients appreciate availability of dosing and may become fearful of discontinuation
How does it really work?

Advantages of PCA device

- Ease of use
- Standard accepted practice for post operative pain control
- Convenience for patient use
- Nurse satisfaction
Choosing the medication

- Morphine
- Hydromorphone
- Fentanyl

Problems with morphine

- Histamine reaction
- Active metabolite
- Tolerance
- Late respiratory depression

Limitations of fentanyl

- Short duration of action
- Frequent Loading
- Tolerance
- Redistribution
Hydromorphone

- Active metabolite
  - neurotoxic effects
- Tolerance
- Euphoria

Traditional post operative PCA

- Demand
- Lock out
- +/- continuous
- Maximum over some period of time

Goals of Pain Management

- Safe
- Functional
- Reduce Pain Score
Use in Chronic Pain Patients

• Acute on Chronic Pain
• Where do you start?
• How can you avoid dramatically increasing tolerance?

Case Report

• MW is a 28 yo WF admitted for her 7th back surgery.
• Prior surgeries have included discectomies, posterior instrumentation and fusion L5-S1, L4-L5, L3-L4, several wash outs for infection and removal of hardware.
• She is currently scheduled for an anterior instrumentation and fusion of L3-S1.

Case Report

• Home meds include:
  • Morphine Sulfate CR 300mg po q 8h
  • Fentanyl transdermal patch 300mcg q 3 days
  • Diazepam 10mg po q 8 hours pm spasms
  • Cyclobenzaprine 10mg q 8 hours pm breakthrough spasms
  • Gabapentin 900mg po q 8 hours
  • Oxycodone 15mg po q 4 hours pm breakthrough pain (up to 4/day)
Case Report

- PACU COURSE
  - Hydromorphone 1-2mg IVP
  - Midazolam 2mg IVP
  - Lorazepam 2mg IVP
  - Hydromorphone PCA was started with 0.5mg/10min lockout/0.5mg continuous.
  - Home meds were restarted (except oxycodone)

MW came out of the OR at 1800 and spent the overnight in PACU

We arrive at 0830 the next morning. We review the history on the PCA pump and this is what we see:

MW Continued

- Overnight IV Hydromorphone PCA doses were titrated to 2mg demand/10min lockout/1mg continuous (total IV Hydromorphone in 12 hours = 80mg)
- She also received several IVP doses of Versed and Ativan
- She reports 10+/10 "EVERYWHERE"
- Surgical sight pain is sharp, stabbing, throbbing and burning in nature
- Reports "nothing" has touched the pain and it is worse than ever
- Pt is sleepy but easily aroused
NOW WHAT?

Review EXPECTATIONS

• How bad was the pain pre-operatively? (Daily pain scores, frequency of breakthrough doses, type of pain)
• What level pain can you function at? (What was she able to do at home in spite of her pain?)
• What is her goal for pain control? (Objective goals--activities she cannot do now but needs to do for recovery/discharge)

★ Our goal for pain control is FUNCTION

What are we worried about?

• Respiratory depression
• Sleep apnea
• Increasing drug tolerance
• Neurotoxic effects of hydromorphone
• Opioid induced hyperalgesia (OIH)
Hyperalgesia

- Patients who display an increase sensitivity to pain
- Exaggerated response to a noxious stimuli
- Painful response to previously non-noxious stimuli (Allodynia)
- Due to damaged nociceptors
- Damage to peripheral nerves

- Opioid induced (OIH)

What is the mechanism?

- Toxic effects of opioid metabolites
- Increase in spinal dynorphin activity
- Enhanced descending facilitation from the rostral ventromedial medulla
- Activation of intracellular protein kinase C
- Central sensitization as a result of opioid related activation on N-methyl-D-asparate (NMDA) receptors in the central nervous system

- Silverman, Teutebart

Ketamine
KETAMINE

• What is it?
  - NMDA receptor antagonist

• How does that help?
  - Increased opioid binding to mu-receptors enhances NMDA receptor sensitivity.
  - This increases calcium passage through the channel resulting in enhanced pain transmission, and enhanced pain perception
    -- Rakic and Golombiewski

Ketamine

• Patient selection
  - Opioid tolerant patients who demonstrate poor pain management efficacy with increasing opioid dosing
  - Patients who experience undesirable side effects from opioids with insufficient pain control

• Cautious use
  - Patients with head injuries
  - Hypertension
  - Tachycardia

Ketamine

• Contraindications
  - Conditions associated with increase intracranial pressure
  - Known seizure disorder
Ketamine

- Dosing Guidelines:
  - General Anesthesia (GA), usual ranges from 1-2mg/kg IVP bolus
  - Procedural sedation, dosing may range from 0.5-1mg/kg bolus
  - Analgesia Guidelines of 0.15mg-0.25mg/kg/hour
- Dosing must be individualized

Ketamine

- Monitoring
  - Routine vitals per standard IV PCA monitoring should be followed
  - Monitoring alertness and orientation
- Side effects
  - Dizziness
  - Excessive salivation
  - Tachycardia/hypertension
  - Nystagmus

Case Study outcome

- MW was able to get OOB to chair
- Deep breath
- Transitioned to oral meds without increasing long acting analgesics
- Was provided increase frequency of PRN meds
Use of PCA in the Addicted patient

• "Control" issue
• Use despite harm
• Patient rights

How do you make it work

• Limit control with effective use of lock out
• Give a continuous
• Demand doses should be no more than 100% more than continuous

(continuous = 1mg  demand dose may be 1mg q 30mins)

Assess and manage co-morbidities

• Anxiety
• Depression
• Borderline personality
Optimize Use of adjuvants

- IV acetaminophen
- IV nsaids
- Thermo therapy
- Muscle relaxants
- Relaxation/guided imagery/distraction
- Anxiolytics

Assessment of pain is mostly subjective

- Management of pain MUST be OBJECTIVE

- Remember the goals
  - safety
  - function
  - improved pain scores

Case Study

CL is a 35 year old male with Crohn’s disease. He is s/p skin graft of his left inner thigh/groin with donor sight right thigh. Pt is opioid tolerant, well know to our service from multiple admissions and surgeries. Home pain meds include:

“I don’t take anything—I have no problem coming off the meds.”
Case Study

Patient had a prolonged length of stay (July – December) with multiple trips to the OR for bowel resections, fistulas, skin graphs, revisions of graphs. During his course of stay patient was followed by our service intermittently and placed on IV Dilaudid PCA.

Case Study

• Settings ranged from:
  – 0.5mg q 10 mins without continuous to
  – 2mg every 30 mins with 2mg demand
• Patients daily use of IV Hydromorphone ranged from
  – 25mg IV Hydromorphone/24 hours to
  – 98mg IV Hydromorphone/24 hours

Case Study

• Pain Scores ranged from
  – 4/10 to
  – 10/10 with average daily pain score of
    8/10 Reports “nothing helps”
• Review of the history on the PCA pump showed he got no more than 3 hours sleep at any given time
Case Study

• Added Ketamine to his regime resulted in decrease use of hydromorphone but did not improve his function
• Wife and staff report he was nasty, not himself
• Did not participate in his care
• Refused care of his wounds

Case Study

• Team meeting was held with surgeon, wife, social worker, nurse, nutritionist, behavioral pain specialist, acute pain specialist.
• Goals were set for patients
• Pain management plan was changed

How do you make it work

• Limit control with effective use of lock out

• Give a continuous

• Demand doses should be no more than 100% more than continuous
  (continuous = 1mg demand dose may be 1mg q 30mins)

✓ Choose the appropriate opioid for your patient
Opioid Rotation

December 10, 2010

- Patient was already on MS Contin with IV Hydromorphone
- Transitioned to IV Morphine PCA
  - Settings started at 10mg/60 mins

Case Study

- Patient began to participate in his care
- Wife reports mood improved
- Staff reports patient cooperative with care
- Nutritionist reports improved dietary intake
  - Weight gain
- PT reports prolonged time in whirlpool
- Surgeon reports wound healing

Case Study

December 21, 2010

- Weaned off PCA to morphine elixir 15mg q 3 hours prn
- Morphine elixir 30mg daily on call to whirlpool
- Discharged home December 24, 2010
Ketamine as a primary analgesic

• MC admitted May 31 s/p multi trauma
  1. Open book unstable pelvic fracture
  2. Fractured right sacrum
  3. Grade III open right ankle fracture w/ 30cm laceration
  4. Bladder injury

Over the next 5 days, patient was on IV Morphine PCA with dose titration to comfort.

Total morphine consumption

- Day 1-2: 29mg
- Day 2-3: 87mg
- Day 3-4: 107mg
- Day 4-5: 105mg

On Day 5 of this patients hospital stay, we receive a call that the patient has developed a post operative ileus and the trauma team requests we revise our analgesic plan of care. Team requests NO OPIOIDS.

IV Acetaminophen 1000mg IVP q 6 hours pm and IV Ketamine infusion initiated at 15mg/hr

Patient returned to OR Day 8 to internalize hardware and wash out right ankle wound. Post op team again requests NO OPIOIDS.
Ketamine as a primary analgesic

- Ketamine infusion was titrated to 19mg/hr and IV Acetaminophen 1000mg q 6 hours prn was continued.
- Patients pain scores were better after morphine was discontinued.
- Patients bowel function returned 48 hours after morphine was discontinued and NG decompression was needed for 72 hours total.
- Patient left the hospital 10 days after injury and was ordered oxycodone 5mg q 4 hours pm and requiring 3 doses/day.

Methadone PCA

- CU is a 52yo end-stage colon cancer admitted 5/14 with intractable abdominal pain. Diverting colostomy with stoma prolapsing.
- Was initially started on IV Morphine PCA but quickly changed to IV Hydromorphone with rapid dose titration.
- Pt was npo. Home meds included MS Contin which was initially converted to a continuous infusion of hydromorphone and then converted to fentanyl patch.

Methadone PCA

- By day three of patients hospital stay pt continued to report 10/10 pain. Hydromorphone titrations were futile and patient was changed to IV Methadone PCA.
- Within 2 hours of initiation, patient reported dramatic improvement in pain scores.
- Fentanyl patch was titrated off and methadone po was initiated.
- Hospital day 5 patient was transitioned off methadone PCA and ordered oxycodone 20-30mg q 3 hours PCA.
Methadone PCA

- Patient was discharged home with plan to follow up with his oncologist.
- Patient was readmitted one month later with similar symptoms.
- Again patient started on IV Hydromorphone PCA and again patient without relief and increasing pain
- Transitioned to IV Methadone PCA and discharged to hospice on the same

Nurse Administered Analgesic Dosing

- Cognitive impairments
- Physical limitations
- See position paper
- Remember to use adjuvant medications appropriately

Use of PCA devices in difficult populations