Novantrone® (No VAN trone)
Generic name: mitoxantrone (my toe ZAN trone)

What is Novantrone®?
Novantrone® binds to DNA causing breaks in the DNA strand and also chemical bonding. This blocks the ability of cells to reproduce, particularly those that are reproducing rapidly. Some of the types of cells that reproduce rapidly are white blood cells. Novantrone® interferes with the reproduction of T cells, B cells and macrophages that are believed to be important contributors to multiple sclerosis. Even after cell counts recover, there is a long term shift in lymphocytes CD4 (helper) cells and towards CD8 (suppressor) cells. This results in a decrease in the immune reactivity, and thus a decrease in autoimmunity.

Novantrone® slows the course of multiple sclerosis when used regularly over long periods of time. It does not improve existing symptoms and is not used to treat acute MS attacks.

Starting on Novantrone®.
Since Novantrone® is an immunosuppressant, it is important to determine that there is no infection prior to giving the medication. Also, heart function must be determined. Before each dose, patients receive:
- Blood tests looking for infection and general body health
- Urine tests looking for infection
- Echocardiogram (an ultrasound). This painless test uses sound waves to image the heart to determine heart function and health. Some clinics substitute a MUGA scan (Multiple gate acquisition scan) for the echocardiogram. Echocardiograms are done before each dose and annually after completing the course of treatment with Novantrone®.

After insurance clearance, and after results of the tests listed above are available, the Novantrone® is given in the Ambulatory Care Unit. Most patients have an appointment in the clinic prior to the Ambulatory Care Unit appointment to review these results and to calculate the dose. These two appointments are often done on the same day for convenience. In the Ambulatory Care Unit, an intravenous catheter (IV) is started. Medication is given to prevent nausea and the Novantrone® is then given over approximately 15-30 minutes. Patients may go home immediately after the infusion.

How should Novantrone® be taken?
Novantrone® is given by intravenous injection.
Frequency: Once every 3 months.
Total Dosage: There is a lifetime maximum total dose of 140mg/M2. Since the medication is usually given in doses of 12mg/M2 this means that most patients receive 11 doses over 2 ½ years.
Laboratory tests are done before each dose (see above). Blood tests are sometimes done about 10-14 days after a dose as well.

What if a dose is missed?
Contact the MS Center as soon as you remember in order to schedule your next dose. Doses should be given 3 months apart.

What are the common side effects?

- **Leukemia:** The most serious side effect of Novantrone® is acute promyelocytic leukemia. The exact rate is unknown, but studies show leukemia rates ranging from 0.25% (2 ½ per 1000) to 2.82% (2.82 per 100).
- **Heart:** Novantrone® can directly damage the heart muscle, interfering with its ability to pump blood (congestive heart failure). It does **not** affect the heart blood vessels and thus does **not** cause heart attacks. The risk of causing damage to the heart is what limits the lifetime total dose to no more than 140mg/M2. This is also the reason that echocardiograms are done before each dose. If early damage is detected, then the medication is discontinued. It is also necessary to do echocardiograms annually after completing the Novantrone®. It has not been determined when these annual echocardiograms can be stopped.
- **Low blood counts:** Novantrone® causes a marked decrease in white blood counts for 10-14 days. Rarely, red blood cells or platelets may also be affected. This can cause:
  - An increased risk of infection, especially urinary tract infections, oral ulcers/infections and pneumonia.
  - Anemia
  - Difficulty with blood clotting, bleeding or bruising.
- **Blue color:** Novantrone® is a dark blue color. It can cause the whites of the eyes to turn blue and the urine green for 2-3 days after each infusion. This completely resolves.
- **Nausea:** The nausea from Novantrone® is usually mild. Patients are treated with anti-nausea medications prior to the infusion. A prescription for anti-nausea pills is also provided. The nausea lasts for a few days after each infusion.
- **Fatigue:** Patients commonly feel fatigue and exhaustion for 10-21 days after each infusion.
- **Hair loss:** The hair loss from Novantrone® is usually mild. Most patients notice only mild hair thinning with minimal if any cosmetic effect. The hair follicles recover within 2-3 months.
- **Periods:** Most women stop having their periods while on Novantrone®. After stopping the medication, periods usually return within a few months. A small number of women have the permanent loss of periods that can cause infertility.
• Injection site. This medication is meant to be used intravenously. If given into the tissues under the skin, it can cause severe damage to these tissues with loss of tissue, scarring or discoloration.

**Company Support:**
MS Lifeline<sup>SM</sup> - 1-877-447-3243

Insurance billing codes: J9293