BC Cancer Protocol Summary for Treatment of Locally Advanced Breast Cancer using DOXOrubicin and Cyclophosphamide followed by DOCEtaxel and Trastuzumab

Protocol Code  
BRLAACDT

Tumour Group  
Breast

Contact Physician  
Dr. Karen Gelmon

ELIGIBILITY:
- locally advanced and inflammatory breast cancer with the invasive cancer showing overexpression of HER-2 less than or equal to 60 years of age or fit greater than 60 years of age.
- HER-2 overexpression defined as either IHC3+, or FISH amplification ratio greater than or equal to 2 per BC Cancer central laboratory
- ECOG 0-2
- No clinically significant cardiac disease
- LVEF greater than or equal to 55%* after the AC portion of chemotherapy
- Adequate marrow, renal, and hepatic function
- Anticipated survival of greater than 5 years
*If the LVEF is greater than LLN for the institution but less than 55%, the oncologist may decide to treat based on clinical assessment.

EXCLUSIONS:
- Pregnancy
- Significant cardiovascular disease and/or LVEF less than 55%; if initial reading after AC is less than 55%, physician may consider repeating for validity, or assessing LVEF by the other modality, ie. Echo instead of MUGA

TESTS:
- Baseline: CBC & diff, platelets, liver enzymes (liver enzymes should be measured prior to first cycle of AC and first cycle of DOCEtaxel, see Precaution #5 for guidelines regarding hepatic dysfunction and DOCEtaxel)
- Before each treatment: CBC & diff, platelets
- MUGA scan or echocardiogram: prior to first treatment with trastuzumab and every 3-4 months until completion of treatment per the discretion of the treating physician. The maximum time between cardiac monitoring should be 4 months (see dose modification #4 for adjustment of trastuzumab based on changes in LVEF)
- If clinically indicated at any time: creatinine, MUGA scan or echocardiogram, liver enzymes
PREMEDICATIONS:
- For the 4 cycles of DOXOrubicin and cyclophosphamide: Antiemetic protocol for highly emetogenic chemotherapy (see protocol SCNAUSEA)
- For the 4 cycles of DOCEtaxel:
  - dexamethasone 8 mg PO bid for 3 days, starting one day prior to each DOCEtaxel administration; patient must receive minimum of 3 doses pre-treatment
  - Additional antiemetics not usually required.
- For trastuzumab: not usually required
- DOCEtaxel-induced onycholysis and cutaneous toxicity of the hands may be prevented by wearing frozen gloves starting 15 minutes before DOCEtaxel infusion until 15 minutes after end of DOCEtaxel infusion; gloves should be changed after 45 minutes of wearing to ensure they remain cold during the entire DOCEtaxel infusion.

TREATMENT:
- 4 consecutive cycles of DOXOrubicin and cyclophosphamide

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>BC Cancer Administration Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOXOrubicin</td>
<td>60 mg/m²</td>
<td>IV push</td>
</tr>
<tr>
<td>cyclophosphamide</td>
<td>600 mg/m²</td>
<td>IV in NS 100 to 250* mL over 20 min to 1 hour</td>
</tr>
</tbody>
</table>

*Use 250 mL for dose greater than 1000 mg

- Repeat every 21 days x 4 cycles
- Followed by 4 consecutive cycles of DOCEtaxel concurrent with trastuzumab to start 21 days after final cycle of DOXOrubicin and cyclophosphamide

Cycle 5

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>BC Cancer Administration Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>trastuzumab</td>
<td>8 mg/kg</td>
<td>IV in NS 250 mL over 1 hour 30 min Observe for 1 hour post-infusion**</td>
</tr>
<tr>
<td>DOCEtaxel</td>
<td>100 mg/m²</td>
<td>IV in NS 250-500 mL* over 1 hour (use non-DEHP equipment)</td>
</tr>
</tbody>
</table>

*use 250 mL for doses 74-185 mg, use 500 mL for doses greater than 185 mg
Cycle 6, 7, and 8

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>BC Cancer Administration Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>trastuzumab</td>
<td>6 mg/kg</td>
<td>• IV in NS 250 mL over 1 hour on the second dose (Cycle 6). Observe for 30 minutes post infusion**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IV IN NS 250 mL over 30 min on all subsequent doses (Cycle 7, 8), if no adverse reactions. Observe for 30 min post infusion**</td>
</tr>
<tr>
<td>DOCEtaxel</td>
<td>100 mg/m²</td>
<td>IV in NS 250 to 500 mL* over 1 hour (use non-DEHP equipment)</td>
</tr>
</tbody>
</table>

* use 250 mL for doses 74 to 185 mg, use 500 mL for doses greater than 185 mg

**observation period not required after 3 consecutive treatments with no reaction

- Repeat every 21 days x 4 cycles
- Followed by 13 consecutive cycles of trastuzumab to start 21 days after the final cycle of DOCEtaxel/trastuzumab for a total of 1 year of trastuzumab treatment. See BC Cancer Protocol BRAJTR.

Radiation:
For patients with indications for radiation, the radiation treatment should be given at the usual time after the completion of the chemotherapy with the trastuzumab continued during the radiation therapy. There has been no increased toxicity reported in the clinical trials at this time, but there is no long term data; therefore, patients should be monitored. There have been no studies of concurrent trastuzumab and internal mammary node radiation, so it is unclear at this time whether there would be an enhanced risk of cardiotoxicity. If there is an anticipated need for internal mammary node radiation, it may be helpful to discuss the overall treatment program and timing with the treating radiation oncologist at the outset of chemotherapy.

DOSE MODIFICATIONS:
1. Hematological

For cycles of DOXOrubicin and cyclophosphamide only:

<table>
<thead>
<tr>
<th>ANC (x10⁹/L)</th>
<th>Platelets (x10⁹/L)</th>
<th>Dose (both drugs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>greater than or equal to 1.5 and greater than or equal to 90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>1.0 to less than 1.5 or 70 to less than 90</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>less than 1.0 or less than 70</td>
<td>delay</td>
<td></td>
</tr>
</tbody>
</table>
For cycles of DOCEtaxel only:

<table>
<thead>
<tr>
<th>ANC (x 10^9/L)</th>
<th>Platelets (x10^9/L)</th>
<th>Dose</th>
<th>Dose after Neutropenic Sepsis on DOCEtaxel</th>
</tr>
</thead>
<tbody>
<tr>
<td>greater than or equal to 1.5 and greater than or equal to 90</td>
<td>100%</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>1.0 to less than 1.5 or 70 to less than 90</td>
<td>75%</td>
<td>delay</td>
<td></td>
</tr>
<tr>
<td>less than 1.0 or less than 70</td>
<td>delay</td>
<td>delay</td>
<td></td>
</tr>
</tbody>
</table>

2. **Renal dysfunction**: Dose modification may be required for cyclophosphamide. Refer to BC Cancer Drug Manual.

3. **Hepatic dysfunction**: Dose modification required for DOXOubicin and DOCEtaxel. Refer to BC Cancer Drug Manual for DOXOubicin and BC Cancer chemotherapy protocol BRAVDOC for DOCEtaxel.

4. **Cardiac Dysfunction**

   **Asymptomatic Patients – Trastuzumab continuation based on serial LVEFs**

<table>
<thead>
<tr>
<th>Relationship of LVEF to LLN</th>
<th>Absolute Decrease Of less than 10 points from baseline</th>
<th>Absolute Decrease Of 10 to 15 points from baseline</th>
<th>Absolute Decrease Of greater than or equal to 16 points from baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within Normal Limits</td>
<td>Continue</td>
<td>Continue</td>
<td>Hold *</td>
</tr>
<tr>
<td>1 to 5 points below LLN</td>
<td>Continue</td>
<td>Hold *</td>
<td>Hold *</td>
</tr>
<tr>
<td>greater than or equal to 6 points below LLN</td>
<td>Continue *</td>
<td>Hold *</td>
<td>Hold *</td>
</tr>
</tbody>
</table>

   ➢ *Repeat LVEF assessment after 3 to 4 weeks, consider cardiac assessment
   ➢ If criteria for continuation are met – resume trastuzumab
   ➢ If 2 consecutive holds or a total of 3 holds occur, discontinue trastuzumab

   **Symptomatic Patients**

   ➢ Symptomatic patients with evidence of cardiac dysfunction should have trastuzumab discontinued


5. **Treatment Interruptions – Trastuzumab**
If an interruption in treatment of greater than 6 weeks occurs (ie more than 6 weeks has elapsed since the last treatment was given), consider repeating the loading dose of 8 mg/kg, and then resume usual dosing.

**PRECAUTIONS:**

1. **Febrile Neutropenia.** DOCEtaxel containing adjuvant chemotherapy for breast cancer is associated with an extreme risk of febrile neutropenia approaching 40% in real practice settings, as reported in two outcome studies from Ontario. Thus, strong consideration should be given to using prophylactic filgrastim (G-CSF). Febrile neutropenia rates with prophylactic G-CSF are lower (5 to 7%) making this the safer option. Fever or other evidence of infection must be assessed promptly and treated aggressively.

2. **Extravasation (DOXOrubicin and DOCEtaxel):** DOXOrubicin and DOCEtaxel cause pain and tissue necrosis if extravasated. Refer to BC Cancer Extravasation Guidelines.

3. **Cardiac Toxicity (DOXOrubicin):** DOXOrubicin is cardiotoxic and must be used with caution, if at all, in patients with severe hypertension or cardiac dysfunction. Cardiac assessment recommended if lifelong dose of 450 mg/m² to be exceeded. Refer to BC Cancer Drug Manual.

4. **Fluid Retention (DOCEtaxel):** Dexamethasone premedication must be given to reduce incidence and severity of fluid retention with DOCEtaxel.

5. **Hepatic Dysfunction (DOCEtaxel):** DOCEtaxel undergoes hepatic metabolism. Hepatic dysfunction (particularly elevated AST or ALT) may lead to increased toxicity and usually requires a dose reduction. Baseline liver enzymes are recommended before cycle 1 and then if clinically indicated (eg, repeat liver enzymes prior to each treatment if liver enzymes are elevated or there is severe toxicity such as neutropenia). Note: this information is intended to provide guidance but physicians must use their clinical judgement when making decisions regarding monitoring and dose adjustments.

6. **Hypersensitivity reactions** to DOCEtaxel are common but it is not necessary to routinely initiate the infusion slowly. If slow initiation of infusion is needed, start infusion at 30 mL/h x 5 minutes, then 60 mL/h x 5 minutes, then 120 mL/h x 5 minutes, then complete infusion at 250 mL/h (for 500 mL bag, continue 250 mL/h for 5 minutes and then complete infusion at 500 mL/h). Refer to BC Cancer Hypersensitivity Guidelines.

7. **Interstitial pneumonitis (DOCEtaxel)** may occur. Risk may be increased with radiation therapy.

8. **Trastuzumab infusion-associated symptoms,** usually chills and fever, occur in 40% of patients during the first trastuzumab infusion (infrequent with subsequent infusions). Other signs and symptoms may include nausea, vomiting, pain (sometimes at tumour sites), rigors, headache, dizziness, dyspnea, hypotension, rash and asthenia. Symptoms may be treated with acetaminophen, diphenhydrAMINE and meperidine with or without an infusion rate reduction.

   Rarely, serious infusion-related reactions have been reported (3 per 1000 patients) sometimes leading to death (4 per 10,000). Reactions include dyspnea, hypotension, wheezing, bronchospasm, tachycardia, reduced oxygen saturation and
respiratory distress, and, uncommonly, allergic-like reactions. Patients experiencing
dyspnea at rest due to pulmonary metastases and other pulmonary/cardiac
conditions may be at increased risk of a fatal infusion reaction and should be treated
with extreme caution, if at all. For serious reactions, discontinue the trastuzumab
infusion and provide supportive therapy such as oxygen, beta-agonists and
corticosteroids

9. **CNS Metastases on Adjuvant Trastuzumab:** Patients with her2/neu
overexpression have been observed to have a higher than usual risk of developing
CNS metastases. The CNS is a sanctuary site, unreached by most adjuvant
systemic agents. There is little or no data to guide physicians in the circumstance of
a patient developing isolated CNS metastasis while on adjuvant therapy with a
trastuzumab-containing regimen. In various cancer settings, some individuals who
develop isolated metastases, who are managed with aggressive local therapy and
systemic treatment as appropriate, may yet obtain durable remissions. In view of
this, the Breast Tumour Group members would propose that, if a patient develops
limited and isolated CNS metastases while on an adjuvant trastuzumab regimen,
resection of metastases and CNS radiation should proceed if feasible. If all visible
disease has been resected, providing a chance of long-term remission, then it would
be up to the discretion of the treating oncologist whether to continue to complete the
intended year of adjuvant trastuzumab. Alternately, patients could suspend therapy
with trastuzumab at that time, and resume it at the time that non-CNS metastases
were detected. If, at the time of presentation with CNS metastases on therapy, there
were metastases also found outside the CNS, trastuzumab therapy should be
discontinued and not restarted.

10. **A possible interaction between warfarin and trastuzumab** has been reported.
An increased INR and bleeding may occur in patients previously stabilized on
warfarin. The interaction was noted in two patients after 8 to 10 doses of
trastuzumab. An INR prior to starting the trastuzumab is recommended, then every
2 weeks for the first 3 months and then monthly if stable. Inform patient to watch for
any bleeding. Modification of the warfarin dose may be needed.

Call Dr. Karen Gelmon or tumour group delegate at (604) 877-6000 or 1-800-663-
3333 with any problems or questions regarding this treatment program.

References:
1. Wolmark, N et al. The effect on primary tumor response of adding sequential Taxotere to Adriamycin
Vandenberg T, Younus J, and Al-Hkayyat S. Febrile neutropenia rates with adjuvant docetaxel and
cyclophophamide chemotherapy in early breast cancer: discrepancy between published reports and
4. Chan A et al. Impact of colony-stimulating factors to reduce febrile neutropenic events in breast
cancer patients receiving docetaxel plus cyclophosphamide chemotherapy. Supp Care Cancer 2011,
19: 497-504.
5. Jones S et al. docetaxel with cyclophosphamide is associated with an overall survival benefit
compared with doxorubicin and cyclophosphamide: 7-year follow-up of US Oncology Research Trial