

## ASPETTI GENERALI

La scelta del trattamento nel malato con oligometastasi: criteri di selezione e valutazione dei risultati
E. Maranzano, Terni - F. Trippa, Terni


## ASPETTI GENERALI

+ OLIGOMETASTASES definition
\& Patient selection
* Evaluation of therapeutic results



## ASPETTI GENERALI

* OLIGOMETASTASES definition

4 Patient selection

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## Oligometastases

-The Halsted theory ( $\mathrm{T} \rightarrow \mathrm{N} \rightarrow \mathrm{M}$ ) proposed that cancer spread is orderly, extending in a contiguous fashion from the primary tumor through the lymphatic to the lymph nodes and then to distant sites (1907).

- A subsequent Hellman theory of systemic disease hypothesis (T $\rightarrow$ M) proposed that clinically apparent cancer is already a systemic disease (1980).
- A third Hellman \& Weichselbaum' theory of spectrum hypothesis: cancer range between disease that remains localized and disease that is systemic at time of diagnosis $\rightarrow$ multistep nature of cancer progression (1995).

The occasional success of surgical excision of one or a small number of pulmonary mets, brain mets or hepatic mets (e.g., $25 \%$ of cure after hepatic resections for metastatic colorectal cancer) lets to hypothesize the theory of oligometastases

Journal of Clinical Oncology, Vol 13, No 1 (January), 1995: pp 8-10

## Oligometastases

## Hellman \& Weichselbaum suggested that

for many cancers a few metastases exist at first, before the malignant cells acquire widespread metastatic potential.

## Consequently,

if radical intervention (Surgery or Stereotactic Body Radiotherapy SBRT) could be delivered during an oligometastatic phase, the intervention could change disease progression in pts who would otherwise have been treated palliatively in most settings (the hierarchy theory)

## Solitary Metastases: Illusion Versus Reality

Philip Rubin, MD, Ralph Brasacchio, MD, and Alan Katz MD, MPH
"Suddenly a solitary horseman appeared on the horizon, then another, then another . . . in a few moments a whole crowd of horsemen swooped down upon him."-Leacock

Can a solitary nodule truly be the only metastatic lesion? or is it the

## first nodule/horseman on the horizon before the horde appears?



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M1: a solitary metastasis in a single organ
M2: oligometastases, designate number and limited to 1 organ
(5 nodules, 5 cm in total)
Serum molecular markers as follows:
SO: not detectable
S1: detectable, low level
S2: intermediate level
S3: high level
A. no systemic signs: minimal $5 \%$ weight loss, minimal lab abnormalities.
B. systemic signs: 100\% weight loss, cachexia, fevers nexplained, lab abnormalities, (i.e. altered lung function, abnormal liver enzymes)

Solitary Metastases: Illusion Versus Reality
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## THE MAJOR METASTATIC ORGAN SITES

* Solitary lung mets
* Solitary liver mets
* Solitary brain mets
* Solitary bone mets
* Other solitary site mets:

H\&N, eye \& orbit, ovary \& vagina, heart, intestines

## OLICOMETASTASES

## Definition

An intermediate state of cancer spread between localized disease and wide spread mets
the implication is that oligometastatic disease may be cured with metastasis-directed therapy

# Extracranial Oligometastases: A Subset of Metastases Curable With Stereotactic Radiotherapy 

Kimberly S. Corbin, Samuel Hellman, and Ralph R. Weichselbaum, University of Chicago Medical Center, Chicago, IL


## Stereotactic Body Radiotherapy (SBRT)

## OLICOMETASTASES

- Incidence has not been well established
- Prognosis can be derived from surgical reports (lung mets from sarcoma
liver mets from colorectal cancer, oligometastasis from breast cancer)
$\rightarrow$ this subset of patient can be cured in about 15-20\% of cases
- Diagnosis
$\rightarrow$ Potential differential genetic signature between samples isolated from pts with few or many mets (e.g., microRNA 200c expression or microRNA signature)
$\rightarrow$ Hierarchy to the appearance of metastatic sites (i.e., early mets may be of limited nature and early therapy could prevent future spread)
$\rightarrow$ Potential increase of early identification of oligometastasis with PET-CT (e.g., NSCLC with mets to adrenal gland at diagnosis) Curable With Stereotactic Radiotherapy

Kimberly S. Corbin, Samuel Hellman, and Ralph R. Weichselbaum, University of Chicago Medical Center, Chicago, IL

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Hierarchy to the appearance of metastatic sites (i.e., early mets may be of
limited nature and early therapy could prevent future spread)
Potential differential genetic signature between samples isolated from pts
with few or many mets (e.g., microRNA 200c expression or microRNA
signature).

## Incidence of oligometastases

## Lung met from sarcoma

Liver-only mets from colorectal cancer

Distant failure from breast cancer

## 19\% one met

Gadd MA et al: Ann Surg 1993

49\% one met
38\% $\leq 3$ mets
Kienski et al: Ann Surg Oncol 2010

16\% (median 1,7)

Dorn P et al: Int J Radiat Oncol 2011

Distant failure from lung cancer
19\%

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# Extracranial Oligometastases: A Subset of Metastases Curable With Stereotactic Radiotherapy 

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SBRT treatment of limited metastases has shown promising local control rates for treated metastases, ranging from $67 \%$ to 95\%

Two- to 3-year survival rates have been reported in the range of 30\% to 64\%

SBRT results compare favorably with surgical results.
SBRT is less invasive than surgery and may be more broadly applicable to greater numbers of tumors in various organs

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$\rightarrow$ this subset of patient can be cured in about 15-20\% of cases
- Diagnosis
$\rightarrow$ Potential increase of early identification of oligometastasis with PETCT (e.g., NSCLC with mets to adrenal gland at diagnosis)
$\rightarrow$ Potential differential genetic signature between phenotype isolated in oligometastatic pts (e.g., microRNA 200c expression or microRNA signature).


## Review Article

Oligometastases and Oligo-recurrence: The New Era of Cancer Therapy<br>Yuzuru Niibe* and Kazushige Hayakawa

Department of Radiation Oncology, Kitasato University School of Medicine, Sagamihara, Kanagawa, Japan

## OLIGO-RECURRENCE

Patient with a limited number of metastases and controlled primary tumor

## Table 1.

Oligometastases and oligo-recurrence

Oligometastases
Hellman and Weichselbaum (1) Niibe et al. (2,3,4)
Reference
Primary lesion
No. of distant/metastases/recurrences One to several
Uncontrolled/controlled
Controlled
One to several (one is better)



## ASPETTI GENERALI

* OLIGOMETASTASES definition
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## PATIENT SELECTION

## 3 distinct cohorts of pts with oligometastases

* those who present with oligometastatic disease
* those with induced oligometastatic disease after cytoreductive therapy
* those with relapsed oligometastatic disease after curative locoregional therapy

These different groups probably have different prognoses, so therapeutic approaches might differ

## PATIENT SELECTION



AC Tree, Lancet Oncol 2013;14:e28-37

## PATIENT SELECTION

## Imaging $\rightarrow$ Oligometastasis/es



AC Tree, Lancet Oncol 2013;14:e28-37

## PATIENT SELECTION



## PATIENT SELECTION

On the basis of HISTOLOGY
$\rightarrow$ Better survival for breast cancer with respect to colorectal \& lung
$\rightarrow$ Radioresponsive vs radioresistant histologies

Surgery for (?)*..

- kidney clear cell tumor,
- melanomas, or
- sarcomas
* Please note the ablative radiation effect that is not necessary related to radiosensibility!


## PATIENT SELECTION



## PATIENT SELECTION

## On the basis of METASTATIC SITE

## Surgery

- for peripheral lung mets $\rightarrow$

- for easy accessible liver masses $\rightarrow$ •
- when spinal stabilization is necessary $\rightarrow$
- to remove bone impingement to the spine $\rightarrow$


## Radiation therapy

- in other cases


## PATIENT SELECTION



## PATIENT SELECTION

## On the basis of PERFORMANCE STATUS

## Surgery

- for good PSK pts?


## Radiation therapy

- in the other cases ?!


## PATIENT SELECTION




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## EVALUATION OF THERAPEUTIC RESULTS

## * Local control

\& Disease-free survival (\& Freedom from widespread distant metastasis!)

* Toxicity rate
* QoL


## EVALUATION OF THERAPEUTIC RESULTS

+ Local control rate: 67-95\%
Note that: most in-field recurrence occur (!)
$\rightarrow$ 2-year in-field control rate (i.e., duration of response) ~20\%

4 Disease-free survival (\& Freedom from widespread distant metastasis?)

* Toxicity rate
* QoL

| Oligometastases Treated With Stereotactic Body | Int J Radiation Oncol Biol Phys, |
| :--- | :--- |
| Radiotherapy: Long-Term Follow-Up of Prospective Study | Vol. 83, No. 3, pp. 878-886, 2012 |

Michael T. Milano, M.D., Ph.D.,* Alan W. Katz, M.D., M.P.H.,*
LOCAL CONTROL (LC)

The breast cancer patients had a 2-, 4-, and 6-year lesion LC rate of $87 \%$;
the nonbreast cancer patients had a 2-, 4-, and 6-year lesion LC rate of $74 \%, 68 \%$, and $65 \%$, respectively.


Fig. 2. Kaplan-Meier actuarial lesion local control for breast cancer (red line) and nonbreast cancer (blue line) patients. A color
\& CT and MRI are routinely used to evaluate response to therapy, with RECIST criteria.

* Postsurgical and postradiotherapy fibrosis and necrosis of both malignant tissue as well as surrounding normal tissue, often making it difficult to differentiate between malignant and non-malignant tissues in surveillance CT and MRI imaging

The utility of FDG-PET for assessing outcomes in oligometastatic cancer patients treated with stereotactic body radiotherapy: a cohort study

## EVALUATION OF THERAPEUTIC RESULTS

* Local control
* Disease-free survival (\& Freedom from widespread distant metastasis!)
* Toxicity rate
* QoL


Figure 2. Disease-free survival in patients with oligometastatic disease at 17-48 months' follow-up
Dotted line represents mean proportion of patients who were disease free at the reported timepoint, weighted for number of patients in each cohort. Error bars represent 95\% confidence intervals.

## EVALUATION OF THERAPEUTIC RESULTS

## + Local control

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Michael T. Milano, M.D., Ph.D.,* Alan W. Katz, M.D., M.P.H.,*

## EVALUATION OF THERAPEUTIC RESULTS

## Freedom from widespread distant metastasis survival

Widespread distant metastases are defined as distant progression not amenable to resection or locally ablative therapy
(i.e., SBRT, stereotactic radiosurgery, radiofrequency ablation, embolization).

## EVALUATION OF THERAPEUTIC RESULTS

* Local control
* Disease-free survival (\& Freedom from widespread distant metastasis!)
* Toxicity rate
$\rightarrow$ Toxicity is directly correlated to:
* administered dose,
tumor volume,
tumor site.
* QoL


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## EVALUATION OF THERAPEUTIC RESULTS

* Local control
* Disease-free survival (\& Freedom from widespread distant metastasis!)
* Toxicity rate
$\rightarrow$ Toxicity is low if radiation dose constraints to normal tissues are respected
* QoL


## NCCN

National
Comprehensive
Cancer
Network ${ }^{*}$

## NCCN Guidelines ${ }^{\text {TM }}$ Version 1.2011 Non-Small Cell Lung Cancer

Table 5. Normal Tissue Dose Volume Constraints for SBRT*

| OAR | 1 Fraction | 3 Fractions | 4 Fractions | 5 Fractions |
| :---: | :---: | :---: | :---: | :---: |
| Spinal cord | 14 Gy | $\begin{aligned} & \hline 18 \mathrm{~Gy} \\ & (6 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ | $\begin{aligned} & \hline \hline 26 \mathrm{~Gy} \\ & \text { (6.5 Gy/fx) } \end{aligned}$ | $\begin{aligned} & \hline 30 \mathrm{~Gy} \\ & (6 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ |
| Esophagus | 15.4 Gy | $\begin{aligned} & 30 \mathrm{~Gy} \\ & (10 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ | $\begin{aligned} & 30 \mathrm{~Gy} \\ & \text { (7.5 Gy/fx) } \end{aligned}$ | $\begin{aligned} & \text { 32.5 Gy } \\ & \text { (6.5 Gy/fx) } \end{aligned}$ |
| Brachial plexus | 17.5 Gy | $\begin{aligned} & 21 \mathrm{~Gy} \\ & \text { ( } 7 \mathrm{~Gy} / \mathrm{fx} \text { ) } \end{aligned}$ | $\begin{aligned} & \text { 27.2 Gy } \\ & \text { (6.8 Gy/fx) } \end{aligned}$ | $\begin{aligned} & 30 \mathrm{~Gy} \\ & \text { ( } 6 \mathrm{~Gy} / \mathrm{fx} \text { ) } \end{aligned}$ |
| Heart/ pericardium | 22 Gy | $\begin{aligned} & 30 \mathrm{~Gy} \\ & (10 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ | $\begin{aligned} & 34 \mathrm{~Gy} \\ & \text { (8.5 Gy/fx) } \end{aligned}$ | $\begin{aligned} & 35 \mathrm{~Gy} \\ & (7 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ |
| Great vessels | 37 Gy | $\begin{aligned} & 39 \mathrm{~Gy} \\ & 13 \mathrm{~Gy} / \mathrm{fx} \end{aligned}$ | $\begin{aligned} & 49 \mathrm{~Gy} \\ & 12.25 \mathrm{~Gy} / \mathrm{fx} \end{aligned}$ | $\begin{aligned} & \hline 55 \mathrm{~Gy} \\ & 11 \mathrm{~Gy} / \mathrm{fx} \\ & \hline \end{aligned}$ |
| Trachea/ Large Bronchus | 20.2 Gy | $\begin{aligned} & 30 \mathrm{~Gy} \\ & (10 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ | $\begin{aligned} & \text { 34.8 Gy } \\ & \text { (8.7 Gy/fx) } \end{aligned}$ | $\begin{aligned} & 40 \mathrm{~Gy} \\ & (8 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ |
| Rib | 30 Gy | $\begin{aligned} & 30 \mathrm{~Gy} \\ & (10 \mathrm{~Gy} / \mathrm{fx}) \end{aligned}$ | $\begin{aligned} & \text { 31.2 Gy } \\ & \text { (7.8 Gy/fx) } \\ & \hline \end{aligned}$ | $\begin{aligned} & \text { 32.5 Gy } \\ & \text { (6.5 Gy/fx) } \end{aligned}$ |
| Skin | 26 Gy | $\begin{aligned} & 30 \mathrm{~Gy} \\ & 10 \mathrm{~Gy} / \mathrm{fx} \end{aligned}$ | $\begin{aligned} & 36 \mathrm{~Gy} \\ & \text { (9 Gy/fx) } \end{aligned}$ | 40 Gy 8 Gy/fx |
| Stomach | 12.4 Gy | $\begin{aligned} & 27 \mathrm{~Gy} \\ & 9 \mathrm{~Gy} / \mathrm{fx} \end{aligned}$ | $\begin{aligned} & 30 \mathrm{~Gy} \\ & \text { (7.5 Gy/fx) } \end{aligned}$ | $\begin{aligned} & 35 \mathrm{~Gy} \\ & 7 \mathrm{~Gy} / \mathrm{fx} \end{aligned}$ |

## EVALUATION OF THERAPEUTIC RESULTS

## * Local control

* Disease-free survival (\& Freedom from widespread distant metastasis!)
*Toxicity rate
* QoL


## EVALUATION OF THERAPEUTIC RESULTS

## QoL

Since SBRT is associated with low toxicity rates with respect to surgery, the QoL benefit is probably greater

## Objective

- To develop a relevant set of items assessing quality of life (QOL) issues in patients with malignant spinal cord compression (MSCC), not sufficiently covered by the European Organization for Research and Treatment of Cancer (EORTC) C15-PAL core questionnaire.

Table 1: Top 10 QOL issues ranked by patients ( $\mathrm{n}=35$ )

| Patients' <br> Rank | QOL Issues | Freq <br> (\%) | HCPs' <br> Rank |
| :---: | :--- | :---: | :---: |
| 1 | Have you had difficulty performing self- <br> care (i.e. bathing, dressing)? | 48.6 | 4 |
| 2 | Did you have trouble controlling your <br> bladder? | 42.3 | 3 |
| 3 | Did you have lower back pain? | 42.3 | 7 |
| $\mathbf{4}$ | Have you had difficulty in carrying out <br> usual daily tasks (i.e. grocery shopping, <br> housework)? | 40.0 | N/A |
| 5 | Have you worried about becoming <br> dependent on others because of your <br> illness? | 40.0 | 6 |
| 6 | Have you worried about becoming bed- <br> bound because of your illness? | 31.4 | 10 |
| 7 | Did you have upper back pain? | 28.6 | N/A |
| 8 | Did you have to modify your daily <br> activities because of your illness? | 28.6 | 9 |
| 9 | Have you worried about loss of mobility <br> because of your illness? | 28.6 | 7 |
| 10 | Did you hope treatment would reduce <br> pain as much as possible? | 28.6 | N/A |

1 = Top priority issue for patients
Items included within the red box are items ranked by both groups to be in the top 10

Table 2: Top 10 QOL issues ranked by health care providers ( $\mathrm{n}=62$ )

| HCPs' <br> Rank | QOL Issues | Freq <br> $(\%)$ | Patients' <br> Rank |
| :---: | :--- | :---: | :---: |
| $\mathbf{1}$ | Were you able to walk without <br> assistance? | 49.3 | N/A |
| 2 | Did you have weakness of both legs? | 47.9 | N/A |
| 3 | Did you have trouble controlling your <br> bladder? | 45.2 | 2 |
| 4 | Have you had difficulty performing self- <br> care (i.e. bathing, dressing)? | 39.7 | 1 |
| 5 | Did you experience leakage of bowels? | 35.6 | N/A |
| 6 | Have you worried about becoming <br> dependent on others because of your <br> illness? | 28.8 | 5 |
| 7 | Have you worried about loss of mobility <br> because of your illness? | 28.8 | 9 |
| 8 | Did you have lower back pain? | 27.4 | 3 |
| 9 | Have you had to modify your daily <br> activities because of your illness? | 27.4 | 8 |
| 10 | Have you worried about becoming bed- <br> bound because of your illness? | 27.4 | 6 |

[^0]
## Patients suggestions for questions to add:

\& Do you have family support?
\& Do you worry about your ability to drive in the future?
\& Were you able to understand your procedures, treatments, \& medications?

Health care provider suggestions for questions to add:

* Have you experienced weakened relationships with family or friends?
* Do you feel like a burden to family/friends?
\& Does MSCC have an effect on sexual function?
* Do you have control of your bowel or bladder?
\& Are you worried of becoming dependant on others now?
\& Are you more concerned about bodily pain or weakness/paralysis in the arms and/or legs?

Canadian-led International Development of a European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Module for Malignant Spinal Cord Compression
~RESEARCH PROTOCOL~
ODETTE CANCER CENTRE, CANADA
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Ashwini Budrukkar
AUSTRALIA \& NEW ZEALAND
To be determined at April meeting
GERMANY
Dirk RADES
ITALY
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## CONCLUSIONS

# Extracranial Oligometastases: A Subset of Metastases Curable With Stereotactic Radiotherapy 

Kimberly S. Corbin, Samuel Hellman, and Ralph R. Weichselbaum, University of Chicago Medical Center, Chicago, IL

## Selected Ongoing Prospective Trials for Oligometastases

| Trial Name or Number | Design | Eligibility | Intervention |
| :---: | :---: | :---: | :---: |
| SABR-COMET | Randomized | All metastatic sites treatable; maximum of three tumors to any single organ system; controlled primary tumor | Standard RT VS SBRT |
| UPCI 10-028 | Phase II |  |  |
| UPCI 10-027 | Phase II |  |  |
| NCT01565837 | Phase II |  |  |
| NCT01185639 | Phase II |  |  |
| PulMiCC | Randomized | Pulmonary metastases from colorectal cancer | nonitoring vs Surgery |

Ultimately, a randomized trial of ablative radiotherapy and/or surgery compared with the standard of care may be necessary to define the role of ablative modalities in oligometastases.

## Panel: Evidence-based practice for extracranial oligometastases

- Stereotactic body radiotherapy results in a high control rate of treated metastases (~80\%)
- About $20 \%$ of patients are progression free at 2-3 years after stereotactic body radiotherapy
- Toxicity is low
- Stereotactic body radiotherapy should be considered in patients with isolated metastases, especially if the disease-free interval is longer than 6 months
- Randomised trials are needed to establish whether stereotactic body radiotherapy improves progression free and/or overall survival
- Patients most likely to benefit from stereotactic body radiotherapy have:
- Long disease-free interval
- Breast histology
- One to three metastases


Giotto - Scrovegni - Christ among the Doctors


[^0]:    1 = Top priority issue for health care providers
    Items included within the red box are items ranked by both groups to be in the top 10

