Assessing response to chemotherapy in metastatic melanoma with FDG PET: early experience

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Abstract

The role of 18-Fluoro-2-deoxyglucose (FDG) positron emission tomography (PET) is becoming established in the staging of patients with melanoma. In other malignancies, the use of FDG-PET as an imaging biomarker for early re-staging to assess chemotherapy response is proving valuable.

Materials and methods

From January 2004 to April 2006, patients with metastatic melanoma who underwent a baseline PET study prior to chemotherapy and a repeat re-staging study after two to four cycles of chemotherapy were included. The study population comprised of seven patients (age range 32-49 years). All patients were referred from a single physician (MH). Table 1 shows the clinical characteristics of the patients studied.

PET data acquisition

All PET scans were performed as a half-body scan (base of skull to upper thighs) after a 6hr fast. All patients were examined with dual-modality PET-CT (General Electric Discovery ST, Wisconsin, USA), which consists of a four-row spiral CT and a full-ring Bismuth-Germanate (BGO) PET. Images were acquired in 2D mode. CT was performed for attenuation correction and anatomical localization. Images were reconstructed with an iterative technique using an ordered subset expectation-maximization (OSEM) algorithm. Two experienced nuclear medicine

physicians read all scans. Response was assessed visually. Follow-up was obtained from histology where available, review of correlative imaging and patient medical records. Follow-up was obtained until death of patient (One patient was lost to complete follow-up.)

Results

At baseline, there was intense FDG uptake in all metastases with an average max SUV of 17.2 (Table 3). The number of metastatic sites ranged from five to greater than twenty.

Four patients had combination chemotherapy with CVD regimen and three patients had single agent DTIC chemotherapy. Re-staging was performed after three cycles in 6 patients, and after two cycles in one. There was a complete metabolic response (CMR) in one patient, which was maintained on further PET scanning after a completion of a further three cycles of chemotherapy, and on a further PET study 3 months later. A partial metabolic response (PMR) was observed in two patients, and progressive metabolic disease occurred in four patients.

Survival was 679 days in the single patient with a complete metabolic response, median of 206 days in the patients with partial metabolic response and 129 days median in the patients with progressive disease. One patient with a partial response was still alive 11 months post initial chemotherapy.

Conclusion

As newer therapies for melanoma become available, PET may be useful as an imaging biomarker that can be used in place of classic endpoints in evaluating treatment response. Randomised studies of PET/CT vs CT may be warranted in this setting.

Authors declare no conflict of interest

Tables

Table 1. Clinical characteristics of patients in study (NB: patient initials to be removed prior to publication)

Patient no.	Age	Sex	Breslow thickness	Melanoma type	Site of primary disease	Sentinel lymph node status	Interval between diagnosis and initial recurrence	Initial site of recurrence
1 JT	32	F	<1cm	nodular	H&N	not indicated	3yr	Distant node
2 JB	58	F	0.37cm*	acral lentigenous	LL	not indicated	13yr	Regional node
3 CS/ CC	24	F	0.7mm	acral lentigenous	UL	not indicated	5yr	Regional node
4 SM	52	F	3.2mm	superficial spreading	LL	not performed	8yr	Regional node
5 RW	49	M	1.26	nodular	UL	negative	4yr	In-transit
6 AB	49	M	???	???	trunk	not performed	2yr	Lung, nodal, liver, colon, muscle, brain
7 TP	46	M	0.6mm	metastasis**	HN	not indicated	6mnth	Liver, bone, subcutaneous, brain

UL upper limb, LL lower limb, H&N head and neck
*vascular invasion present, **metastasis favoured rather than primary

Table 2. Results

Patient No.	Sites prior to chemotherapy	Prior treatment	Chemo	No of cycles	PET response	Days until death*	Subsequent management and follow-up
1 JT	Nodal, brain	WBI	CVD	2	PMR	215	Further 2 cycles given. Deterioration in CNS symptoms with mixed response on MRI. Changed docarbazine to temozolamide and further 2 cycles
2 JB	Liver, adrenal	Nodal dissection	DCIC	3	PMD	??	Palliative therapy
3 CC	Nodal, bone	Nodal dissection	CVD	3	PMD	alive	Palliative therapy (radiotherapy to spine, bisphosphonate)
4 SM	Nodal, liver, lung	Nodal dissection	DTIC	3	PMD	115	Palliative therapy
5 RW	Liver, lung	Nodal dissection	CVD	3	CMR	679	3 further cycles chemoRx. Further PET study: CMR. 13mths post initial chemoRx CNS symptoms with brain mets on MRI. Palliative radiotherapy. RIP 22mnths post chemoRx, 28mths post recurrence
6 AB	Brain	Brain radioRx	DTIC	3	PMR	198	Good PMR. Further 3 cycles given good PMR on repeat PET. Developed increasing left leg weakness from brain met, therefore chemoRx withheld.
7 TP	Liver, bone, subcutaneous, brain	nil	CVD	3	PMD	143	Palliative care RIP 13/3/06

WBI - whole brain radiation, CMR - complete metabolic response, PMR - partial metabolic response, PMD - progressive metabolic disease , CVD - cisplatin, vinblastine/vindesine, dacarbazine, DTIC - dacarbazine

*days from commencement of initial chemotherapy until patient death

Table 3. No of lesions and maxSUV before and after chemotherapy

	Baseline study		Post chemotherapy	
Patient no	No PET avid lesions	Max SUV	No PET avid lesions	Max SUV
1 JT	>20	19.3	3	9.1
2 JB	5	19.0	7	21.6
3 CC/CS	>20	20.0	3	9.1
4 SM	5	21.8	10	22.5
5 RW	5	14.2	0	0
6 AB	6	13.0	4	4.3
7 tp	4	4	6	13.0