



Correspondence

Coronary artery disease and lunar catecholamine cardiomyopathy



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ABSTRACT

Objective: Show how lunar catecholamine cardiomyopathy alone, exemplified by Neil Armstrong's single space walk, prior to exposure to inhalation of fine particulate matter, can trigger "Neil Armstrong Syndrome" or by Irwin with coronary, possibly hypertensive heart disease, and catecholamine cardiomyopathy. With space flight, invariably magnesium ion deficits, catecholamine elevations, vicious cycles. Design Use lunar heart rates while configuring rover to show severe tachycardia component of the syndrome. Use Irwin's stress test—"cyanotic fingernails" to support Apollo 15 Space Syndrome. Use Irwin's autobiography to compensate for often incomplete data. Results Paper shows that both Irwin as well as Armstrong meet criteria of my 2nd. Space Syndrome: severe thirst, severe shortness of breath, severe tachycardia, the latter, corrected by replenishing plasma volume. Conclusions Irwin, with a history of hypertension prior to the Apollo 15 mission and classical angina during Earth reentry, may have had coronary as well as hypertensive heart disease whereas there was no evidence that Armstrong had these conditions prior or during his mission. However both, on return to Earth, had abnormal stress tests.

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Whereas Man's first adventure on the moon is exemplified by Neil Armstrong's probable catecholamine cardiomyopathy and the "Neil Armstrong Syndrome" on Apollo 11, James Irwin's apparent acute heart failure, during his 3 day return to Earth from Apollo 15, provides another example of this condition but also a complication of coronary and probable hypertensive heart disease. Both cases provide examples of severe thirst, apparently corrected during the 3 day return to Earth; severe dyspnea, in Armstrong's case while on the moon and in Irwin's case during reentry, and severe tachycardia (conductive to oxidative stress) with Armstrong's lunar rate to 160 and Irwin's to 167; in both cases, corrected during Earth return. (Fig. 1) Both cases are consistent with the "Neil Armstrong Syndrome" with Armstrong's heart rate falling to 60, a half hour before splashdown, whereas Irwin's heart rate fell to 85, early in his stress test, on the day of return (R + 0) (Fig. 2) [1–3]. Fig. 3. Historical document, 20 July 1969, showing Armstrong's lunar shortness of breath at 111 h, 32 min and persisting at 111 h, 36 min after lift-off. Fig. 4. Historical document, 24 July 1969 Showing Armstrong's heart rate down to 61, while still in microgravity, approximately 30 min before splashdown, Pacific. Whereas Armstrong had only one lunar excursion, and therefore no exposure to a confounder, i.e. inhalation of highly toxic iron-laden dust, brought into the lunar habitat on the space suit, there was much longer exposure with 3 excursions on Apollo 15, followed by orbiting the moon for 48 h, prior to the 3 day journey back to Earth. Inhalation of this toxic dust could have been

an important contributing factor not only for Irwin's severe dyspnea during reentry but also for his stress test—cyanosis of his nail beds. (Fig. 2) [4–6] The presence of this cyanosis, supports my "Apollo 15 Space Syndrome" [3] manifested by severe pain of the finger tips with compression by the finger nails; Irwin described in his autobiography, that by trimming his nails, he did not experience any pain during the 2nd. and 3rd. lunar excursions; along with his freedom from pain of the finger tips while under water during his training. I postulated that the pain was due to plasma fluid trapped in the distal portion of the fingers; this was supported years later, when I obtained evidence of "cyanosis of the finger nails;" this could be due to venous blood, trapped peripherally. This also provides a clue to the presence of endothelial dysfunction with ischemia, often silent. Irwin had a myocardial infarction, 21 months after Apollo 15. His history of hypertension (145/110) a month prior to Apollo 15 apparently played a contributing role in his severe stress test—hypertension (275/125), after only 3 min on an exercise bicycle, probably the 2nd. day after return. Vital information was provided in Irwin's autobiography: "To Rule the Night." [7] The following are 2 examples, without which, this example of an Apollo 15 case could not have been published. "I didn't get any water during the EVA. Each of us had a plastic bag full of water attached inside our suits. There was a nozzle that you'd bend down to open a valve so you could suck the water out and drink it within the protection of the space suit. But I never got a single drink of water during the whole time I was out on the surface of the moon; this plus heavy perspiration probably contributed to my losing all the potassium in my system. This was to cause me trouble later;" Both missions, Apollo 11 and 15, exemplify the importance of the INVARIABLE magnesium deficits in Space

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A comparison of the heart rates of Irwin and Scott on the first lunar excursion of Apollo 15

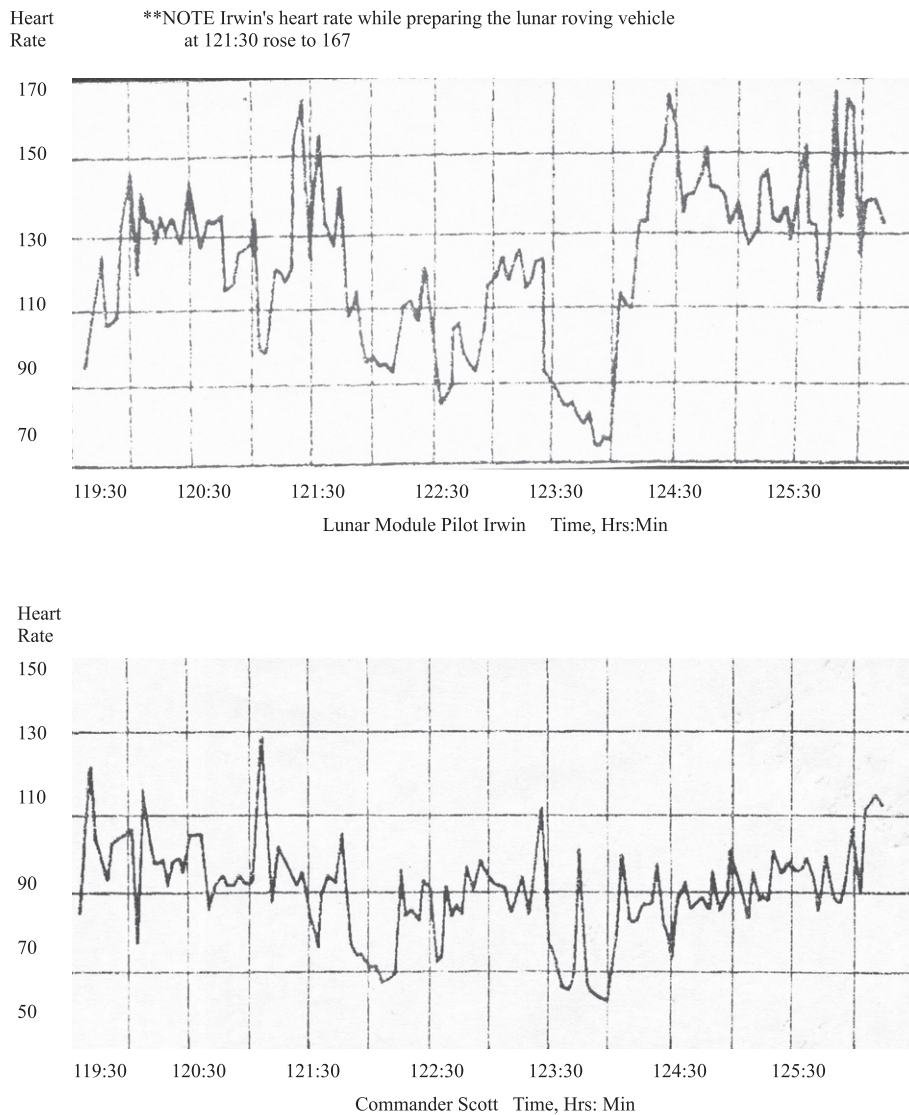


Fig. 1. A Comparison of the Heart Rates of Irwin and Scott on the first Lunar Excursion of Apollo 15.

and the importance of Mg in thermoregulation; heat-related loss of Mg with sweating and through the kidneys; also the fact that a severe potassium deficit can't be corrected without Mg replacement; furthermore, the combination of dehydration, Mg deficits, angiotensin and catecholamine elevations; the latter to twice Earth levels when supine [10], with vicious cycles; either not appreciated or unknown at the time of Apollo 11 in 1969 and Apollo 15 in 1971. Furthermore, without Irwin's autobiography [7] the degree of dyspnea he experienced would not have been recognized. Irwin described the following: At the time of the radio blackout during the reentry, with the necessity of making a recording: "It was amazing to me that Dave was able to talk to Mission Control while we were coming in. I couldn't take a breath. I was living on residual oxygen in my lungs. It felt like an elephant was standing on my chest. Couldn't move the diaphragm. Not painful, just a tremendous force on your body." Although there may be a description of only dyspnea with catecholamine cardiomyopathy, in Irwin's case it is impossible to distinguish, how much of his

severe dyspnea was due to coronary artery and possible hypertensive heart disease with congestive heart failure, [6,9] whereas in Armstrong's case, there was no confounding; no evidence that he experienced angina nor was there a history of hypertension. It was not until the nineties, that it was recognized that, with space flight with the necessity of exercise 2 h a day, there is impairment in thermoregulation; a major contributing factor is the importance of Mg in thermoregulation [8] I visited Irwin's widow in 2002 for more information; Irwin died in 1991 after his 4th myocardial infarction. His widow provided me with the following: "Jim's cooling system was working in his suit. He did not select enough cooling temperature for the suit. He said he wished he had selected a little cooler temperature but then Jim always liked the heat and the direct sunshine. "Not only was the lunar temperature at noon 250 F. but the Apollo astronauts trained in "intense summer heat."—conductive to a Mg deficit. [8] The Apollo 15 mission was also complicated by arrhythmias [6] involving both Scott and Irwin; Irwin's brief bigeminy-

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