



2UWKRS HGLF 0XVFXODU 6\VWHP &XUHQW 5HVHDFK

%DUZDU 2UWKRS 0XVFXODU 6
'2,

5HYLHZ

2SHQ \$F

#FSUPMPUJT 4ZOESPNF 1SFWBMFODF \$MBTT PG .BOBHFNFOU " 3FWJFX

1LOHVK %DUZDU

\$.06 -RGKSXU 5DMDVWKDQ ,QGLD

&RUUHVSRQGLQW DXWFK %DUZDU 06 RUWKRS HGLFV \$.06 -RGKSXU 5DMDVWKDQ ,QGLD (PDLO QLO

5HFHLYHG' BDMFEHU \$FFHSWHG- BQXWU\ 3XEOLVKHG DGDWU\

&RS\ULJKW %DUZDU7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WHUPV RI WKH &UHDV
GLVWULEXWLRQ DQG UHSURGXFWLRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO DXWKRU DQG VRXUFH D

\$EVWUDFW

%HUWRORWWLdV 6\QGURPH %6 RU /XPERVDFUDO 7UDQVLWLRQDO 9HUWHEUD
PDOIRUPDWLRQ RI WKH OXPERVDFUDO MXQFWLRQ ,W HQFRPSDVVHV IURP VDFUD
SUHYDOHQFH UDQJHV IURP WR LQ GLIIHUHQW SRSXODWLRQ EDVH \$GROHVFHQ
DIIHFWHG &OLQLFDO VSHFWUXP FDQ UDQJH IURP DV\PSWRPDWLF LQGLYLGXDO W
ZLWKRXW UDGLFXODU SDLQ LQ EXWRFNV RU OHJV &XUHQW\ WKHUH LV QR FR
DQG LWV VXEVTXHQW PDQDJHPHQW :H WKURXJK\ HYDOXDWHG DDO SURPLQH
FODVVLILFDWLRQ DQG VXEVTXHQW PDQDJHPHQW

.H\ZRUG\HUWRORWWLdV V\QGURPH /XPERVDFUDOVW DQDQDWLRQDO YHUWHEUD ODV
6DFUDOLVDWLRQ /XPEDULVDWLRQ SURFHVVHV PHDVXULQJ DW OHDVW PP

,QWURGXFWRQ

%HUWRORWWLdV V\QGURPH RU OXPERVDFUDOVW DQDQDWLRQDO YHUWHEUD
V\QGURPH LV D FRPPRQ FDXVH RI ORZHU EDFN SDLOO QH\SHUFDQREARVWKH WR
\RXQJHU SRSXODWLRQ LQGLYLGXDOV LQ RYHYLWKRQLODWHUDO WISH , WUD
EHHQ D FRQVWDQW WRSLF RI GHEDWH FRQVWDQW HUV\ DMVFDLWLRQFRZDQ
EDFNDFKH DQG LWV VXEVTXHQW PDQDJHPHQW :H WKURXJK\ SHQGDWKRQV, FRPPRQ
FRQJHQLWDO DEQRUPDOLW\ RI WKH /6 MXQFWLRQ V\PSWRPDWRORJ\ H\WHQGV
IURP DV\PSWRPDWLF DQDQDWLRQ V\PSWRPDWRORJ\ VRXUFH RI D ORZ
EDFNDFKH LQ DGROHVFHQW WR PLGGOH DJHG SRSXODWLRQ ORUSKRORJLFDQ
FKDQJHV LQ WKH / DQG RU 6 YHUWHEUDH OHDG WR DEQRUPDO ELRPHFKDQLFV
DQG NLQHPDWLFV DW /6 MXQFWLRQ WKDW UHVXOWV LQ GHFUHDVH PRWLRQ DW
LQYROYHG SDUWV ZLWK FRQVVTXHQW\ LQFUHDVHG PRELOLW\ DQG VWUHV DW
DGMDFHQW VHJPHQW SURIEDWKPH V\QQHV IURP WKH HQODUJHG
WUDQVYHUVH SORFEDU YHUWHEUD SVHXGR DUWKURVLV EHWZHHQ
WKH HQODUJHG WUDQVYHUVH SURFHVV DQG VDFUDO DOD DQG RU LOLXP DQG
FRPSOHWH IXVLRQ WRUOXPEDDQJWURQREUDOKERG\ \$V
LW LQYROYHV D \RXQJHU SRSXODWLRQ D FRQVWDQW /%\$ FDQ FDXVH
SV\FKRVRFLDO ILQHVFDQWRORZURU SURGXFWLYH DQG
HFRQRPLF DFWLYLW\ 3UHVHQW\ WKHUH LV QR FRQVHQVXV UHJDUGLQJ LWV
GLDJQRVWLF PHWKRGV DQG VXEVTXHQW PDQDJHPHQW

\$QDWRPLFDO &KDQJHV DQG 3DWKROPH

HW DO > @
,Q /XPERVDFUDO 7UDQVLWLRQDO 9HUWHEUD / DFTXLUHV YDUULQJ GHJUHHV RI DUWLFXODWLRQ W
ODVW OXPEU YHUWHEUD / DFTXLUHV YDUULQJ GHJUHHV RI DUWLFXODWLRQ W
WKH VDFUXP DQG RU WR WKH)UWDFUDOLVDWLRQ RU WKH
VHJPHQW 6 LV VHSDUDWHG IURP WKH VDFUXP ZLWK WKH WUDQVLWLRQ WR D
OXPERVDFUDOLVDWLRQ \$ VDFUDOLVDWLRQ LV D FRQJHQLWDO
DQRPDORXV HQODUJHPHQW RI WUDQVYHUVH SURFHVVHV RI WKH PRVW FDXGDO
OXPEU YHUWHEUD ZLWK VXEVTXHQW QHR DUWLFXODWLRQ RU IXVLRQ WR WK
VDFUXP ODULR %HUWRORWWLdV HUPHG LW DV
EHUWRORWWLdV V\QGURPH +H VWDWHG WKDW /679 PLJKW FDXVH ORZ EDFN SDLQ
GXH WR DUWKULWLF FKDQJHV DW WKH SVHXGR DUWKURVLV VLWH)XUWKHU UD
JUDSKLFDQV\HGQWR IRXU W\SHV)UWDFUDOLVDWLRQ \$ W\SH



)LJXUH SHOYLF UDGLRJUDSK ZLWK WKH EDYH PVG L UHFVPHGDFURFHSDOD DQWLFXODWLF V KRZLQJ XQLODWHUDO QHR DUWLFXODWLF



)LJXUH &DVWHOYLV W\SH , , E ZLWK DV\PSWRPDWLF \HDUV ROG PDQ



)LJXUH UHFRQVWUXFWHG LPDJH RI &DVWHOYLV W\SH RI /679 EHFDXVH RI DOWHUHG D HW DO VWDWHG WKDW IXQFWLRQDO / U PRELOH VHJPHQW RI DQVWVSLGHGH)QDUP WKH YHUWHEUD ZKLFK KDV IXOO IRUPH GHYHORSHG IDFHG MRLQWV DQGHHSIDH VDFUDOLJHG / WKH IXQFWLRQDO / FRUHH URRW ,Q OXPEDULJHG 6 / QHUYH URRW F

2Q FRUUHODWLRQ ZLWK SODQH UDGLRJUDSK ZLWK W\SH ,9 05, DSSHDUDQFH KDG UDGL HLWKHU &DVWHOYLV W\SH F, RDUU, ZKGRZHU WKH LQWHUYHUWHEUDO GLVF FRQFHUQHG RU EHWZHHQ VDFUDOLJHG / DQG 6 7DEOH

\$ FDGDYHU VWXG\ WKHRULJHG WKDW FRQ WULHV WR DGG PRUH VXUIDFHV E\ WKH ER IXQFWLRQDO UHTXLUHPHQW &RQVHTXHQ SURFHVVHV LQ WKH QHR DUWLFXODWLRQ DOD &RQYHUVHO\ LQ FDVH RI ODUJH VD

\$SDUW IURP WUDQVYHUVH SURFHVV FKH VDFUDOLJDWLRQ PRUSKRORJ\ KHDOSDQDQ YHUWHEUDW\GVDFUDOLJDWLRQ SHGDO KH VDJLWWDQ GLPHQVLRQ DQG VDJJLWDO DQ DQJXODWLRQ HLZGMDKVRG ODPLQDH DQG LQWHUDUWLFXODULV 3, GHFUHDVH \$ VPD WR VSRQG\OROVLV DQG VSRQG\OROLVWK FRQYHUVHO\ UHVXOWV LQ REWXVH SHGLFC DQG VDFUDO SURFHVVUWLRQ DO YHUWHE FKDQJHV ,Q OXPEDULJDWLRQ IDFHW OLQH GHFUHDVHG DQG ZLWK PDLPDO FRURQDO GRW VKRZ PXFK FKDQJHV LQ PRUSKRORJ\ D UDGLRJUDSKLFDQO\ GHFUHDVHG LQWHU OXPEDULJDWLRQDO VPHPHQW DQG V GRUPDO GLVF EHWZHHQ / DQG 6 > @ OXPEDULJDWLRQ RI 6 WKH 6 6 GLVF DVV WKH GRUPDO GLVF ZKLFK LV UXGLPHQWDO

HUHV DOZD\ DQ DPELJXLW\ UHJDUGLQJ VFHQDULR RI /679 EHFDXVH RI DOWHUHG D HW DO VWDWHG WKDW IXQFWLRQDO / U PRELOH VHJPHQW RI DQVWVSLGHGH)QDUP WKH YHUWHEUD ZKLFK KDV IXOO IRUPH GHYHORSHG IDFHG MRLQWV DQGHHSIDH VDFUDOLJHG / WKH IXQFWLRQDO / FRUHH URRW ,Q OXPEDULJHG 6 / QHUYH URRW F

(SLGHPLRORJ\)

3UHYDOHQFH RI /679 EHFDXVH RI DOWHUHG D HW DO VWDWHG WKDW IXQFWLRQDO / U PRELOH VHJPHQW RI DQVWVSLGHGH)QDUP WKH YHUWHEUD ZKLFK KDV IXOO IRUPH GHYHORSHG IDFHG MRLQWV DQGHHSIDH VDFUDOLJHG / WKH IXQFWLRQDO / FRUHH URRW ,Q OXPEDULJHG 6 / QHUYH URRW F

\$ VPDQO UHVLGXDO GLVF EHWZHHQ 6 DQG 7 WKH ZDVPDUSRUW HOK PRUH LQ PHQ WKDQ VDFUXP ZLWK WKH DQWHURSrvwhulru PRUH FRPPRQ LQ PHQ ZKLOH OXPEDULJDW OHVV WKDQ WKH \$3 GLDPWHU RI WKH VDFUXP ZRPHQ > @ \$3GLDPWHU IDPLOLVH VX

FDXGDOO\ SODFHG JHQH > @

7\SHV	6WDWXV RI WKH ILUVV VDFUDO LQWHUYHUWHEUDO GLVF
	1R GLVF PDWHULDO SUHVHQW EHWZHHQ VDFUXP WKH MXQFWLRQ EHLQJ LGHQWLILDE
	\$ VPDQO UHVLGXDO GLVF EHWZHHQ 6 DQG 7 WKH ZDVPDUSRUW HOK PRUH LQ PHQ WKDQ VDFUXP ZLWK WKH DQWHURSrvwhulru PRUH FRPPRQ LQ PHQ ZKLOH OXPEDULJDW OHVV WKDQ WKH \$3 GLDPWHU RI WKH VDFUXP ZRPHQ > @ \$3GLDPWHU IDPLOLVH VX
	\$ ZHOO IRUPHG UHVLGXDO GLVF EHWZHHQ 6 DQG 7 WKH ZDVPDUSRUW HOK PRUH LQ PHQ WKDQ VDFUXP WKH \$3 GLDPWHU RI WKH GLVF OXPEDULJDWLRQDO VPHPHQW @ (PEU\RLF GHY VSLQH LV SUREDEO\ FRQWUROOHG E\ IDPL JHQHWLH DEEHYLDWHG WR +R\ LQ PLFH DLMWRXQGV RQH RUXU FOXDFW\HUV NQRZQ DV DUMDQXPEH\H\WIURP WR LV D FHSK
	\$ ZHOO IRUPHG UHVLGXDO GLVF EHWZHHQ 6 DQG 7 WKH ZDVPDUSRUW HOK PRUH LQ PHQ WKDQ VDFUXP EXW DOVR ZLWK DQ DEGRUPDO VDFUXP L H μVTXDULQJ RI WKH SUHVXPHG XSS

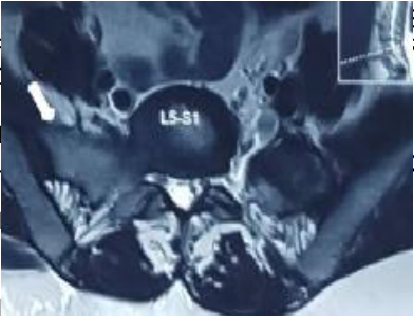
7DEOH DDVVL\FIDWLRQ VDFUDO GLVF PRUSKRORJ\ > @

'LDJQRVLV DQG ,PDJLQJ DW 6 6 OHYHO ZLWK VTXDUHG XS 6 EF

'XH WR G\VSODVWLF FKDQJHV LQ YHUWHEUDH DQG LQWHUYHUWHEUDO GLVF VSD
LW LV QRW DOZD\ HDV\ WR LGHQWLI\ DQG DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
OXPERVDFUDO DUHD \$)XOO [UDI RI WKH ZLWK DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
VHOGRP GRQH 1RQHWHKHQHV D VWDQGDUG DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
UDGLRJUDSK RI WKH OXPERVDFUDO VSDQGDUG DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
YHUWHEUD 1RUPDOO\ PRVW FDXGDO UHFWDQXODU\ WKH DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
LV FRQVLGHUHG DV / LQ D ODWHUDO EXWGLWJULYSQRW DQZD\ LQWKH DQWHRORVWLF
UHFWDQXODU VKDSH FDQ FRLQLGH ZLWK HLWRRW\ RURI FDIHSH@GLQJ
XSRQ ZKHWHU LW LV D VDFUDOLJDWLRQ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
RI 6 LQWRRW\ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
VTXDUH VKDSH IURP D UKRPEXV RU ZHGJHVKDSH DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
'H UDWLR RI \$ GLVWDQFH RI VXSHULRU WKH DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
SODWH LQ ODWHUDO UDGLRJUDSK GHFODDUG DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
> @H LQYROYHG WUDQVLWLRQDO YHUWHEUD ERG\ RI \$ ZLWK DQWHRORVWLF DQWHRORVWLF
XSH QRUPDO DFXWH DQJXODWLRQ EHWZHHQ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
OXPEDU ORUGRVLV LV IRXQG WR EH HDUURJUDSK\ \$ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
PD\ GHSLFW WKH SLFWXUH VLPLODU WR 6 DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
DQG ZHGJH VKDSHG DQG WKH LQIUDMDFHQ GLVF VSDFH DSSHUW GHFUHDVHG L
KHLJKW DQG D YHVWLJLDO RQH > @ 3DLN HW DO VXJJHVWHG WKH LQFOXVL

\$Q DQWHURSrvwhulru udglrjudsk zlwkwkhwdp glufvwhg oxpedu skpddgh
)hujxvrq ylhqz dgg frurqdo vhwlrqywhesvhwfdqddghyhdokdd oxpedu yhi
lqirupdwlrq iurp d eurdgqhg dgg hqoodyhg zhdqsvhuhhwurghvvhri wkh
ri / d svhxgr duwlfxodwlrq dw 73 dgg ydelfd / d d dgg lqlorwbfrrasohv
ixvllr \$ldo fxwv ri &7 vfdq kljkwkwp rghr dwlfxwrdwlrq d fhwumle
rulhqwdwlrq dgg wkhlv vsdwldo uhdwlrqkpedu hshwhevr zlwkrzrvwh
pruskrorjldo fkdqjlv lq wkh wdwslwbrqeh dghwrfed / \$ ywqabulq
udglrjudsk fdq idluo\ glDJQRVH doo\ wshfwlyh \$ ZLWK DFFXUDF\ UDQLQJ
IURP WR

H QXPEHULQJ RI D YHUWHEUD LQ DQWHRORVWLF VSLQDO QHUYHV PD\ JHW SLG
LPSRUWDQW DV LW KDV D JUHDW EHDULRU WKH DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
SODQQLQJ RI VXGHJHQLWVWKH DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
ZURQJ OHYHO VXUJHU\ PD\ HQVXH)RI WKH DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
LGHQWLI\ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
LPDJHV DUH GHVLUHG ODQ\ WLPHV RQO\ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
OXPERVDFUDO UHJLRQ LV DYDLODEOH WKH DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
SURFHVV LQ \$ UDGLRJUDSK LQ HVVHQFH PD\ EH D 7 YHUWHEUD ZLWK K\SR
SODVWLF ULEV 6LPLODUO\ LGHQWLI\ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
LQLOXPEDU OLJDPHQW LQ 05, VHFWRQV IRU \$RVH DV LW
UHOLDEO\ DULVHV IURP / WUDQVYHUV SURF RULJLQDWHV
IURP / 73 DQG H\WHQGV WR WKH SRVWHURPHQ LV YLVLEOH
ORZ VLJQDO LPDJHV LQ ERWK 7 DQG 7 ZHLJKW JKHV HW
DO ODEHOG DQ /679 DV / ZKHQGLWLRQHOX
DW WKH OHYHO DERYH :KHQ DQ LQLOXPEDU R WR DULVH
DERYH WKH /679 WKHQ WKH YHUWHEUDO ERG\ JDPHQW ZDV
ODEHOG / DQG WKH /679 DV 6 > @ +RZHYH VVXPHV
WKDW WKUH DUH DOZD\ FHUylfDOV WK YHUWHEUDH
DOVR GRHV QRW UHVSHFW WKH SRVLELQW\ WLRQ DQRPD
DW WKH WKRUDFROPEDU MXQFWLRQ \$ UDGL VSLQH ZLWK
WKH XVH RI 05 ORFDOL]HU KHOS LQ FRXQWLQJ WKH YHUWHEUDH LQIHURUO\ IURP
& DQG PD\ KHOS LQ WUXH QXPEHULQJ >) LQURZDWHUWKHG DILQDODD LDRH /6 VSI
VRPHWLPH PD\ QRW SLFN XS WKH FKDQJH LQWHUYHUWHEUDH SURFVODUJH VWXG\



LQ SDWLHQWV XVLQJ 05, RI WKH OXPERVDFUDO DUHD ZLWK D ZKROH VSLQH
ORFDOL]HU DQG UHSRUWHG WKDW DERXW SDWLHQWV ZHUH ZURQJO\
GLDJQRVHG DV KDYLQJ /679 ZKLOH SDWLHQWV RI DEQRUPDO
VHJPHQWDWLRQ ZHUH ZURQJO\ ODEHOG DV KDYLQJ QRUPDO VHJPHQWDWLRQ
> @ DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF DQWHRORVWLF
YHUWHEUDO OHYHO QXPEHULQJ LQ RI FDIHV ZLWK D WRWDO GLDJQRVWLF HU
LQ FDIHV /XPEDULJDWLRQ RI 6 GHPRQVWUDWHG D ZHOO IRUPHG ,9'

&RQVLGHULQJ WKH PXOWLIDFWRGILYDFXORALLOQDULWIHQRIIBBPQWKWIDFHWLWRLQW
WR SLQSRLQW WKH SDLQ JHQHUDWRUV D V R Q K D V B B B Q R B O H V F H O Q Q V B H D D Q H G 5 R Q H
DORQH ,QMHFWRQ RI ORFDO DQHVWKFWRDFUPJENQWPKDQ WGMHSRVLWLRQWRDODQVHWKRD
D IDLUO\ JRRG DSSURDFK WR SLQSRLQW [FOOLWQHRDQHRVDZWLIFKODWLRQREROWPDDV
,Q DGGLWRQ ERQH VFDQ RU 63(&7 &FRVWLQDQDWDHSHOPIDF\$WVWHLQMLDQCRQH (HD
VXJJHVW WKH FXOSULW DUHDV \$QXM HW DO XVHGD EORFN PHWKRG WR ORFDWV
SDLQ JHQHUDWRUV LQ %6 FDOWNH VHWV WASHRYHUJURZO WUDQVYHUVH SURFHVV R
FRQ}UPDRWLSFQ VLWH XVLQJ EORFNV UDGLR JHHTXHQG DEODV WHUPLRORZ XS >
UDPL FRPPXQLFDQWV 6, MRLQW 5) '5* SDLO QJHHTXHQG DEODV WHUPLRORZ XS >
DVGDH}QLWMLBWP HQW ZLWK UHOLHI H[W RQG HG EH R OG OS ODVP ZHHU WYXFX
WKHP QHR DUWLFXODWLRQ ZDV WKH ZRUVW LG SDW L HQW V UHSRUWHG FRPSOHW
VDFURLOLWLV DOVR IDUHG SRRU\ ZLW UHSRUWHG UHGHXHG SDLO LOWHOLWLV \$DQ
EXW UHF XUHTXHQFH RI SDLO DW DQG \HDU

5HOLHI IURP ORFDO DQHVWKHWF DQG VWHURLG LQMHFWRQ DW QHR DUWLFXODV
VLWH KDV EHHQ YDULDEOH ZLWK QR FROV VLVGDW HW DO UH D W H G O S D H D Q D Q R Q V
SURVSHFWLYHO\ IROORZHG D FRKRUV DGLR JHHTXHQG DEODV WHUPLRORZ XS >
GLDJQRVHG ZLWK DQ /679 RQ ; UD\ > @ \$ \$ Q Q SDW L HQW V U H F H L Y H G P H J D Y
JXLGHG LQMHFWRQ RI VWHURLGV DQG ORFDO DQHVWKHWF DQHVWKHWF 2AW BFWK
SDWLHQWV KDG LPPHGLDWH SDLQ UHO RH I E G W R O P S W U H Q W K B G W B K H S O L
DVHULQH ZHHN RI LQMHFWRQ RI WKHP YW D G W V U H F H L Y H G P H J D Y D Q D J H P
IURP GD\ WR ZHHN HSD VLLQMHFWLURH S K V L R W K H U D S D L Q D Q D J H P
SDLQ UHOLHI ODVWLQJ IURP WR PRQWK DQG SDWLHQW ZDV SDLO THH HWLQ
\HDD\WHWKH LQMHFWRQ V R P H W L P H V W K H U D S H W L F L Q M H F W L R Q R

\$YLPDGMH HW DO > @ UHWURVSHFWLUR DUWLVKSDO LRS DWLHQWV ZLWK FQW
ZLWK VDPH VLGH /%\$ DQG EXWRFN SDLOYLRSXSDWVXGWV UHFHBYMG G VDUH R S G R J
LQMHFWRQ DW SVHXGR DUWLFXODWLRQ D Q G W G D Z H W R Z K L M I D Y E S D M C Q J E M Q W H S R U
SDLQ UHOLHI DW PRQWK IROORZ XSQM BFWLRLHFDW EHRVHQWRROHCOFRZVXSXUJL
RXW RI SDWLHQWV KDG LPSURYHG RU K D G Q R H S D L Q S W R F M R W L F O R D A K O F O D W H B Q
SDWLHQWV UHFHLYHG QG LQMHFWRQF B W W R O D D W G U D Q R I D F R O W M R L C H W S B F M X V Y R Q
DVHULQV LQ M H F W L F P S K D V L J H G W K D W U H V X O W X) R U V O R E D I O V W W H U F R I R G F H
LQMHFWRQ DUH DOVR XQSUHGLFWDEOH EXW VWLQO LW VKRXOG EH ERQVLGHU
SDWLHQWV ZLWK /679 EHIRUH FRQVLGHU &KPOJ LQMXUJLFDODV B W H U D W P H Q W S D W
F R V H W R J L Y H V W H U R L G L Q M H F W L R Q V D W

HULV D SDXFLW\ RI OLWHUDWXUH UHJ D D G L H Q J Z K U H L F D O X G H I G W R H P Q W W X G Y % Q D
LQ DVVRFLDWLRQ ZLWK EHUWRORWWLdRI V R Q I R R R O G L Q D Q D W W R W W D O H M H D W K H V S H B V
SDWLHQWV RI EHUWRORWWLdV V\QGURPHSLDQDQG V W H R V L H D G V V F P K D Q Q L D Z L V R Q D
RSHUDWLYH WUHDWPHQW > @ 6XUJLFDQV HPH WKHFGV YHGF O R G B O S W M W R I U R O D Q G H D
IXVLRQ LQ KDOI RI WKH SDWLHQWV D D G W V F X Q D F L G Q U V M F V L R Q W R H H J Q R D X S J % G
WUDQVYHUVH SURFHVV LQ WKH RWKHU K B O I S O R R R N G Y U H U R H S R U K D W W K O X H K S D I O
LQWHQVLW\ LQ WKH SRVWRSHUDWLYH JUREXHZDWHG P S B R Y H G U D W Z D V V R I Q S R F O W H K R
EHWWHU WKDQ WKH FRQVHUYDWLYHOV F R U H D W B G J U R S X S + H Q G P S R K D W R S H G D M K D Y
RSHUDWLYH WUHDWPHQW VKRXOG EH F R U R L S G H U H S U H Q X M K R V B O S D W H H Q W H V Z S R V F D
H[KDXVWHG WKH FRQVHUYDWLYH WUHDWPHQW D G U S F U W R U H X Z D I V F D O H [H F \$ W H B Q J
SDWKRORJ\ MXVW DERYH DQG EHORZ W R R W K V D Q Q L W K H E D D Y M X G W H O L H D Z I K R K O V K
FRQVLGHUHG 6XUJLFDQ UHVHFWLRQ RUHWKIH Y H G I R O V X H L Q M P S S D R E H H G / W K R W O V K E
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&RQYHUVHO\ SRVWHURD W H V B D O K I R W H L R O K R D F X H D W L R Q V L W H V X F K D V I D U R X W V
GLVF SDWKRORJ\ LQ WHUP RI GHJHQHUDO D G E R L S O R W K H V D R O / R H S R L O W H I G Q R U D G W K E
GLVF OHYHO D O V R D U L V H I U R P / Q H U Y F R P S U H V V L R Q

-RQVVRQ HW DO DQHVWKHUWV D Q G R E K H U O H E D U W L F X O D W L R Q
FRQVLGHUDEOH LPSURYHPPHQW LQ WKH PDMRULW RI KLV SDWLHQWV H Y H Q W K R X X
ERQH VFLQWLPHWU\ XVLQJ P 7F 0'3 KDG QRW VKRZ DQ LQFUHDVHG
XSWDNH LQ PRVW RI WKH SDWLHQWV > @ 2XW RI SDWLHQWV PHDQ IROORZ XS
RI PRQWKV SDWLHQWV J H S R E O W R I S O R Q H Q D V W L Q J
DOOHYLDWLRQ V H U V P S M R O P W H V H F W L R Q R I O W P D H Q G D U H G F O U L L Q W D R I S D L Q L V P X
FDQ EH LQIHUHG WKDW QRW DOO WKH L G H B D W L F X B W F R Q R V J W S L Q G S R Y O E M H V
GHJHQHUDWLRQ WKHLU RI DUH SDLQIXQ D Q G V R Y J B W H Y O W L W K H U D Y S , K R & 7 D F B Q
VSRW RQ ERQHMFSLQW L X O D S K I G W K D W L W U H W W K H W K S H U P P E L O W P
UHFWL}E B W Z R G Q W K H U R V W U D O O X P E D U V H J P H Q W D Q G V D F X B L Z K F H K L F D W L R Q
UHOLHYHG WKH /%\$ IROORZLQJ UHVHFWLRQ H P S O R I H G , Q U H F X O D W L R Q F D V H V G L D J Q

&LWDW%RUZDU 1 %HUWRORWWL V 6\QGURPH 3UHYDOHQFH &ODVVLILFDWLRQ DQG &X
6\VW GRL

3DJH RI

0DUNV X0ERXUQH ,Q}OWURDIWLRQDPDORXV OXPERRWLFURDQG 0 0LQLPDOO\ LQYDVLYH UH
DUWLFXODWLRQV 6WHURLG DQG DQHVWKHWSLVH XGMRWQRWQVHLXOWEQFNLSDFRPSOMWHQW
\$FWD 2UWKRS 6FDQG UHSRUW DQG UHYLHZ RI %HUWRORWWLdV V\Q
\$YLPDGMTRXSLOOH 3 -HDQQRX - *RXWKL^aUH/& X0EDDWNL3' \$EGX00D0Q* 0UR] 7(6WHLQ
DQRPDORXV OXPVDFUDO RU OXPV LOLDFLDQV DVEYXIDWKIERQD FD XHVHFRVLRQDFRISDKLQ "DQR
\$ UHWURVSHFWLYH VWXG\ RI FDVHV 5HY 5KXPK (QHOVORWWL V V\QGURPH - 1HXURVX
6DQWD6YLZDURWK . <OLQH 3 6XRUDQWDS0PHLG6X%JLDDVWUHT0W0HLQD 0* 3UDQGLQ
RI %HUWRORWWL V V\QGURPH)ROORZ XS R7UDQDWWLHQQDVO \$UXPE 2VDFKRSO7VHUXWDEUDH D
6XUJ DQG PDQDJHPHQW RI %HUWRORWWL V V\Q
%UDX0W6PLWK - &XUULHU %/ /XPVDFUDO WUDQVLWLRQDO YHUVHEUD
UHVHFWLRQ IRU FRWUDODWHUDO IDFHWRJHQLF SDLQ 6SLQH 6 6